PRECISION SERIES 844 Multi-range Tester

Simpson
No. ET2-150LOR
HASTINGS, MN
LOS ANGELES-CHICAGO-LOGAN, OH
McGREGOR, TX-LOCUST GROVE, GA
U.S.A.

MRC 3-1-65

65

6GJ7- ECF801
P2B

TUBE TEST DATA

FOR MODELS

10-12, 10-15, 10-20, 10-22, 10-54

USE WITH

ROLL CHART MRC F2B

Precision Apparatus Company, Inc.

8000 COOPER AVE. · GLENDALE 27, N. Y. (11227)

TUBE	SECT	A	B	C	D	E	LEVERS W	X	Y	Z	FIL CONT
1AD2	Insert tube in socket with key at 2										
"		4	1	0	28	2	•	-	12	-	1-3
	•(1AD2 - Throw levers 4-5-7-8-9 to "W")										
	(1AD2 - May show short on 4-5-7-8-9)										
	(1AD2 - Red grid cap goes to cap of tube)										
2AH2	Insert tube in socket with key at 2										
"	CAUTION:-Lever 5 must be thrown to "W" position before inserting tube and must remain in "W" position throughout all tests, including short tests.										
"		6	1	0	17	4	5	-	12	-	-
	(2AH2 - Red grid cap goes to top of tube)										
	(2AH2 - May show short on 1-3-4-7-8-9)										
2AS2	Insert tube in socket with key at 6										
"		1	5	0	28	4	-	-	11	-	*
	*(Fil Cont - 2-5-7-8)										
	(2AS2 - Must show short on 2-5-7-8)										
	(2AS2 - Black grid cap goes to top of tube)										
2AV2		7	4	0	24	3	*	-	9	-	4-5
	*(2AV2 - Levers - 1-2-3-6-7-8 must be thrown to "W")										
	(2AV2 - May show short on 1-2-3-6-7-8-9)										
2C50	Tri-1	1	7	21	9	10	-	-	2	1	7-8
"	Tri-2	1	7	21	9	10	-	-	5	4	
2DS4		5	4	12	10	2	-	-	1	2	4-5
	(2DS4 - Use red grid cap)										
2DZ4		2	3	19	10	4	1-2	-	7	6	3-4
	(2DZ4 - Must show short on 1-2-6-7)										
	(2DZ4 - Plate short test - depress 1-7 together)										
	(2DZ4 - Grid short test - depress 2-6 together)										
2HA5		1	3	13	10	2	2	-	5	1	3-4
	(2HA5 - Must show short on 2-7)										
	(2HA5 - Cathode short test - depress 2-7 together)										
2HK5		1	3	14	10	3	2	-	5	1	3-4
	(2HK5 - Must show short on 2-7)										
	(2HK5 - Cathode short test - depress 2-7 together)										
3AF3		3	4	0	15	6	2	-	9	-	4-5
	(3AF3 - May show short on 2-9)										

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
3AJ8	Amp	1	4	14	31	5	-	1	6	2	4-5
"	Osc	1	4	25	10	5	-	-	1	2	
"	Tri	1	4	25	13	5	-	-	8	9	
3AT2	Insert tube in socket with key at 6										
"		4	5	0	6	4	-	-	12	-	5-7
	(3AT2 - Must show short on 2-8)										
	(3AT2 - Red grid cap goes to top of tube)										
3AW3		4	2	0	7	5	-	-	11	-	*
	*(3AW3 - Fil Cont - depress 2, then 3-7-8 together)										
	(3AW3 - May show short on 3-7-8)										
3CA3		7	2	0	19	5	-	-	11	-	2-7
3DZ4		2	3	19	10	5	1-2	-	7	6	3-4
	(3DZ4 - Must show short on 1-2-6-7)										
	(3DZ4 - Plate short test - depress 1-7 together)										
	(3DZ4 - Grid short test - depress 2-6 together)										
3GK6		1	4	21	10	5	-	8	7	2	4-5
	(3GK6 - Must show short on 3-9)										
3HA5		1	3	13	10	4	2	-	5	1	3-4
	(3HA5 - Must show short on 2-7)										
	(3HA5 - Cathode short test - depress 2-7 together)										
3HK5		1	3	14	10	4	2	-	5	1	3-4
	(3HK5 - Must show short on 2-7)										
	(3HK5 - Cathode short test - depress 2-7 together)										
3HM5		2	3	25	14	4	2	-	5	1	3-4
	(3HM5 - Must show short on 2-7)										
	(3HM5 - Cathode short test - depress 2-7 together)										
3HS8	Pen-1	4	4	7	35	5	-	2	8	7	4-5
"	Pen-2	4	4	7	35	5	-	2	3	7	
3HT6		4	4	4	10	5	3	8	7	2	4-5
	(3HT6 - Must show short on 1-3)										
	(3HT6 - Cathode short test - depress 1-3 togehter)										
3JC6		1	4	5	20	5	3	8	7	2	4-5
	(3JC6 - Must show short on 1-3)										
	(3JC6 - Cathode short test - depress 1-3 together)										

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
3JD6		1	4	5	20	5	3	8	7	2	4-5
	(3JD6 - Must show short on 1-3)										
	(3JD6 - Cathode short test - depress 1-3 together)										
4GK5		1	3	11	10	5z	-	-	5	2	3-4
	(4GK5 - Set switch "E" to #6 if there is no 5z position)										
	(4GK5 - Must show short on 1-7)										
	(4GK5 - Cathode short test - depress 1-7 together)										
4GZ5		1	3	20	10	5z	2	6	7	5	3-4
	(4GZ5 - Set switch "E" to #6 if there is no 5z position)										
	(4GZ5 - Must show short on 2-5)										
	(4GZ5 - Grid short test - depress 2-5 together)										
4HA7	Insert tube in socket with key at 3										
"	Tri-1	1	2	35	10	5z	-	-	5	1	2-4
"	Insert tube in socket with key at 5										
"	Tri-2	2	4	36	10	5z	-	-	2	1	4-6
	(4HA7 - Set "E" switch to #6 if there is no 5z position)										
4HC7	Insert tube in socket with key at 0										
"	Tri-1	2	1	26	14	5z	-	-	7	9	1-12
"	Insert tube in socket with key at 6										
"	Tri-2	2	7	34	10	5z	-	-	8	4	5-7
	(4HC7 - Set "E" switch to #6 if there is no 5z position)										
	(4HC7 - Use red grid cap)										
4HK5		1	3	14	10	5z	2	-	5	1	3-4
	(4HK5 - Must show short on 2-7)										
	(4HK5 - Cathode short test - depress 2-7 together)										
	(4HK5 - Set switch "E" to #6 if there is no 5z position)										
4HS8	Pen-1	4	4	7	35	5z	-	2	8	7	4-5
"	Pen-2	4	4	7	35	5z	-	2	3	7	
	(4HS8 - Set switch "E" to #6 if there is no 5z position)										
4HT6		4	4	4	10	5z	3	8	7	2	4-5
4HM6	(4HT6 - Set switch "E" to #6 if there is no 5z position)										
	(4HT6 - Must show short on 1-3)										
	(4HT6 - Cathode short test - depress 1-3 together)										
4JC6		1	4	5	20	6	3	8	7	2	4-5
	(4JC6 - Must show short on 1-3)										
	(4JC6 - Cathode short test - depress 1-3 together)										

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
4JD6		1	4	5	20	6	3	8	7	2	4-5
	(4JD6 - Must show short on 1-3)										
	(4JD6 - Cathode short test - depress 1-3 together)										
4JK6		1	3	9	16	5	-	6	5	1	3-4
4JL6		1	3	2	17	5	-	6	5	1	3-4
5AF11	Insert tube in socket with key at 7										
"	Pen	4	8	2	10	6	-	4	9	5	6-8
"	Insert tube in socket with key at 2										
"	Di-1	4	1	2	10	6	-	-	6	5	1-3
"	Insert tube in socket with key at 0										
"	Di-2	4	1	2	10	6	-	-	8	6	1-12
	(5AF11 - Use red grid cap)										
5BC3	Di-1	3	1	0	19	6	2-8	-	9	-	1-2-3
"	Di-2	3	1	0	17	6	2-5	-	6	-	
	(5BC3 - Must show short on 5-6-8-9)										
5DG4	P1-1	1	1	0	4	6	-	-	7	-	1-3
"	P1-2	1	1	0	4	6	-	-	5	-	
5EW6		1	3	19	21	6	-	6	5	1	3-4
(5GX6 5H≥6)		1	3	10	36	5	-	6	5	1	3-4
5HC7	Insert tube in socket with key at 0										
"	Tri-1	2	1	26	14	6	-	-	7	9	1-12
"	Insert tube in socket with key at 6										
"	Tri-2	2	7	34	10	6	-	-	8	4	5-7
	(5HC7 - Use red grid cap)										
5HG8	Tri	1	4	5	10	6	-	-	7	6	4-5
"	Pen	1	4	7	25	6	-	9	8	2	
	(5HG8 - May show short on 1-3)										
	(5HG8 - Cathode short test - depress 1-3 together)										
5JK6		1	3	9	16	6	-	6	5	1	3-4
5JL6		1	3	2	17	6	-	6	5	1	3-4
5KE8	Tri	2	4	32	10	6	-	-	1	9	4-5
"	Pen	4	4	5	10	6	-	3	6	2	

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
6AF11	Insert tube in socket with key at 0										
"	Tri-1	2	1	19	21	7	-	-	8	6	1-12
"	Tri-2	2	1	19	23	7	-	-	4	3	
"	Insert tube in socket with key at 5										
"	Pen	2	6	5	21	7	-	2	7	3	4-6
	(6AF11 - Use red grid cap)										
6AG11	Insert tube in socket with key at 8										
"	Tri-1	2	9	16	23	7	-	-	2	3	7-9
"	Di-1	3	9	0	16	7	-	-	5	-	
"	Insert tube in socket with key at 2										
"	Tri-2	2	3	16	23	7	-	-	8	7	1-3
"	Di-2	3	3	0	16	7	-	-	5	-	
6AL11	Insert tube in socket with key at 2										
"	Pen-1	4	1	17	10	7	-	9	8	5	1-3
"	Insert tube in socket with key at 6										
"	Pen-2	4	5	2	10	7	-	3	4	1	5-7
	(6AL11 - Use red grid cap)										
6AR11	Insert tube in socket with key at 2										
"	Pen-2	1	3	7	30	7	-	5	4	7	1-3
"	Insert tube in socket with key at 8										
"	Pen-1	1	9	7	30	7	-	4	3	5	7-9
6AS11	Insert tube in socket with key at 0										
"	Tri-1	2	1	20	20	7	-	-	8	6	1-12
"	Tri-2	2	1	20	20	7	-	-	4	3	
"	Insert tube in socket with key at 5										
"	Pen	2	6	15	14	7	-	2	7	3	4-6
	(6AS11 - Use red grid cap)										
6AV11	Insert tube in socket with key at 5										
"	Tri-1	1	6	15	15	7	-	-	2	1	4-6
"	Tri-3	1	6	15	15	7	-	-	7	3	
"	Insert tube in socket with key at 2										
"	Tri-2	1	3	15	15	7	-	-	7	9	1-3
6AX3	Insert tube in socket with key at 5										
"		1	4	0	4	7	2	-	9	-	4-6
	(6AX3 - Must show short on 2-9)										
	(6AX3 - Plate short test - depress 2-9 together)										
	(6AX3 - Use red grid cap)										

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
6AY3		1	4	0	4	7	2	-	7	-	4-5
	(6AY3 - Must show short on 2-7)										
	(6AY3 - Plate short test - depress 2-7 together)										
6AY11	Insert tube in socket with key at 0										
"	Di-2	3	1	0	17	7	-	-	3	-	1-12
"	Tri-2	4	1	13	9	7	-	-	6	5	
"	Tri-1	4	1	13	9	7	-	-	7	8	
"	Insert tube in socket with key at 4										
"	Di-1	3	3	0	17	7	-	-	1	-	3-5
	(6AY11 - Use red grid cap)										
6B10	Insert tube in socket with key at 0										
"	Tri-1	1	1	28	10	7	-	-	6	5	1-12
"	Tri-2	1	1	28	10	7	-	-	4	3	
"	Insert tube in socket with key at 6										
"	Di-1	3	7	0	16	7	-	-	3	-	
"	Di-2	3	7	0	16	7	-	-	1	-	
	(6B10 - Use red grid cap)										
6BA3		3	4	0	16	7	7	-	2	-	4-5
	(6BA3 - May show short on 2-7)										
6BA11	Insert tube in socket with key at 4										
"	Pen-1	4	3	27	27	7	-	7	6	8	3-5
"	Insert tube in socket with key at 0										
"	Pen-2	4	1	21	26	7	-	3	6	4	1-12
"	Insert tube in socket with key at 8										
"	Tri	3	7	16	17	7	-	-	6	4	7-9
	(6BA11 - Use red grid cap)										
6BD11	Insert tube in socket with key at 0										
"	Tri-2	4	1	2	10	7	-	-	4	3	1-12
"	Tri-1	4	1	2	10	7	-	-	8	6	
"	Insert tube in socket with key at 5										
"	Pen	4	4	3	10	7	-	2	7	3	4-6
	(6BD11 - Use red grid cap)										
6BE3	Insert tube in socket with key at 2										
"		3	1	0	16	7	12	-	6	-	1-3
	(6BE3 - Use red grid cap)										
	(6BE3 - Must show short on 6-12)										
	(6BE3 - Plate short test - depress 6-12 together)										

TUBE	SECT	A	B	C	D	E	LEVERS W	X	Y	Z	FIL CONT
6BF8	Di-1	3	4	0	16	7	-	-	9	-	4-5
"	Di-2	3	4	0	16	7	-	-	8	-	
"	Di-3	3	4	0	16	7	-	-	7	-	
"	Di-4	3	4	0	16	7	-	-	3	-	
"	Di-5	3	4	0	16	7	-	-	2	-	
"	Di-6	3	4	0	16	7	-	-	1	-	
6BF11	Insert tube in socket with key at 0										
"	Sec-1	4	1	23	15	7	-	6	7	3	1-12
"	Insert tube in socket with key at 8										
"	Sect-2	1	7	7	10	7	-	5	6	3	7-9
	(6BF11 - Use red grid cap)										
6BJ3	Insert tube in socket with key at 0										
"		3	1	0	16	7	-	-	4	-	1-12
	(6BJ3 - Use red grid cap)										
6BY8	Pen	1	4	20	19	7	-	8	7	1	4-5
"	Di	3	4	0	16	7	-	-	6	-	
6C9	Tet-1	4	4	5	9	7	-	8	9	7	4-5
"	Tet-2	3	4	9	23	7	-	2	3	1	
	(6C9 - Use red grid cap)										
6C10	Insert tube in socket with key at 0										
"	Tri-2	1	1	32	10	7	-	-	5	7	1-12
"	Insert tube in socket with key at 5										
"	Tri-1	1	6	32	10	7	-	-	2	1	
"	Tri-3	1	6	32	10	7	-	-	7	3	
	(6C10 - Use red grid cap)										
6CM5		2	2	1	7	7	1	4	12	5	2-7
	(6CM5 - Must show short on 1-3-4-8)										
	(6CM5 - Cathode short test - depress 3-8 together)										
	(6CM5 - Screen short test - depress 1-4 together)										
	(6CM5 - Use red grid cap)										
6CW4		5	4	9	10	7	-	-	1	2	4-5
	(6CW4 - Use red grid cap)										
6D10	Insert tube in socket with key at 0										
"	Tri-2	1	1	30	10	7	-	-	5	7	1-12
"	Insert tube in socket with key at 5										
"	Tri-1	1	6	30	10	7	-	-	2	1	
"	Tri-3	1	6	30	10	7	-	-	7	3	
	(6D10 - Use red grid cap)										

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
6DE7	Tri-1	1	4	21	15	7	-	-	6	7	4-5
"	Tri-2	2	4	7	8	7	2	-	1	3	
	(6DE7 - Must show short on 2-3)										
6DM4		1	7	-	4	7	-	-	5	-	7-8
6DR7	Tri-1	1	4	20	25	7	-	-	6	7	4-5
"	Tri-2	2	4	21	5	7	2	-	1	3	
	(6DR7 - Must show short on 2-3)										
	(6DR7 - Grid short test - depress 2-3 together)										
6DS4		5	4	12	10	7	-	-	1	2	4-5
	(6DS4 - Use red grid cap)										
6DT4		1	7	0	4	7	1	-	5	-	7-8
	(6DT4 - May show short on 1-5)										
6DW4		3	4	0	16	7	7	-	2	-	4-5
	(6DW4 - May show short on 2-7)										
6DY5		1	4	7	10	7	-	9	7	2	4-5
6DZ4		2	3	19	10	7	1-2	-	7	6	3-4
	(6DZ4 - Must show short on 1-2-6-7)										
	(6DZ4 - Plate short test - depress 1-7 together)										
	(6DZ4 - Grid short test - depress 2-6 together)										
(6ES7 6EH7 s-1-3		1	4	5	23	7		8	7	2	4-5
6FD6		1	3	8	20	7	-	6	5	1	3-4
6FJ7	Insert tube in socket with key at 6										
"	Tri-1	1	5	26	10	7	-	-	4	3	5-7
"	Insert tube in socket with key at 0										
"	Tri-2	1	1	5	10	7	-	-	5	3	
	(6FJ7 - Use red grid cap)										
6FM7	Insert tube in socket with key at 6										
"	Tri-1	4	5	0	23	7	1	-	4	9	5-7
	(6FM7 Must show short on 1-9)										
"	Insert tube in socket with key at 2										
"	Tri-2	2	3	0	10	7	-	-	7	5	1-3
	(6FM7 - Use red grid cap)										
6FQ7	Tri-1	1	4	19	14	7	-	-	6	7	4-5
"	Tri-2	1	4	19	14	7	-	-	1	2	

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
6FY7	Insert tube in socket with key at 5										
"	Tri-1	4	4	15	10	7	-	-	3	2	4-6
"	Insert tube in socket with key at 2										
"	Tri-2	1	1	0	9	7	-	-	7	5	1-3
	(6FY7 - Use red grid cap)										
6G11	Insert tube in socket with key at 6										
"		2	7	5	7	7	-	3	4	1	5-7
"	Insert tube in socket with key at 2										
"		3	1	11	23	7	-	9	8	5-6	1-3
6GB5		3	4	2	16	7	2-7-8	6	12	1	4-5
	(6GB5 - Must show short on 1-2-3-6-7-8)										
	(6GB5 - Grid short test - depress 1-2 together)										
	(6GB5 - Screen short test - depress 6-7 together)										
	(6GB5 - Cathode short test - depress 3-8 together)										
	(6GB5 - Red grid cap goes to top of tube)										
6GE5	Insert tube in socket with key at 5										
"		5	6	7	7	7	8-9	-	7-12	3	4-6
	(6GE5 - Use red grid cap)										
	(6GE5 - Must show short on 2-3-8-9)										
	(6GE5 - Grid short test - depress 3-8 together)										
	(6GE5 - Cathode short test - depress 2-9 together)										
6GF5	Insert tube in socket with key at 5										
"		5	6	7	7	7	8-9	-	7-12	3	4-6
	(6GF5 - Use red grid cap)										
	(6GF5 - Must show short on 2-3-8-9)										
	(6GF5 - Grid short test - depress 3-8 together)										
	(6GF5 - Cathode short test - depress 2-9 together)										
6GF7	Tri-1	5	4	27	10	7	-	-	8	9	4-5
"	Tri-2	2	4	2	10	7	-	-	6	2	
6GJ5		1	4	2	5	7	1-2	7	12	6	4-5
	(6GJ5 - Must show short on 1-2-6-7)										
	(6GJ5 - Grid short test - depress 2-7 together)										
	(6GJ5 - Screen short test - depress 1-6 together)										
6GL7	Tri-1	2	7	15	31	7	-	-	5	4	7-8
"	Tri-2	2	7	5	6	7	-	-	2	1	
6GM5		4	4	3	9	7	-	1	9	6	4-5

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
6GM8	Tri-1	2	4	10	10	7	-	-	6	7	4-5
"	Tri-2	2	4	10	10	7	-	-	1	2	
6GT5		2	4	6	7	7	1-2	-	7-9	6	4-5
	(6GT5 - Must show short on 1-2-6-7)										
	(6GT5 - Grid short test - depress 2-6 together)										
	(6GT5 - Screen short test - depress 1-7 together)										
6GU5		4	3	5	10	7	2	6	5	1	3-4
	(6GU5 - Must show short on 7)										
6GU7	Tri-1	1	4	15	9	7	-	-	6	7	4-5
"	Tri-2	1	4	15	9	7	-	-	1	2	4-5
6GV5	Insert tube in socket with key at 4										
"		2	5	1	9	7	2	7	12	9	3-5
	(6GV5 - Use red grid cap)										
	(6GV5 - Must show short on 1-2-7-8)										
	(6GV5 - Cathode short test - depress 1-8 together)										
	(6GV5 - Screen short test - depress 2-7 together)										
6GV8	Tri	2	4	34	10	7	-	-	1	2	4-5
"	Pent	2	4	7	10	7	-	7	6	9	
6GW6		3	2	0	17	7	-	4	11	5	2-7
6GW8	Tri	4	4	15	10	7	-	-	9	1	4-5
"	Pen	1	4	19	10	7	-	3	6	8	
6GX6		1	3	10	36	7	-	6	5	1	3-4
6GY5	Insert tube in socket with key at 4										
"		3	3	3	15	7	2	7	11	9	3-5
	(6GV5 - Must show short on 1-2-7-8)										
	(6GV5 - Grid #2 short test - depress 2-7 together)										
	(6GV5 - Cathode short test - depress 1-8 together)										
	(6GV5 - Black grid cap goes to top of tube)										
6GY6		1	3	10	32	7	-	6	5	1-7	3-4
6GY8	Tri-1	2	4	0	10	7	-	-	6	-	4-5
"	Tri-2	1	4	30	10	7	-	-	9	3	
"	Tri-3	1	4	31	10	7	-	-	2	1	

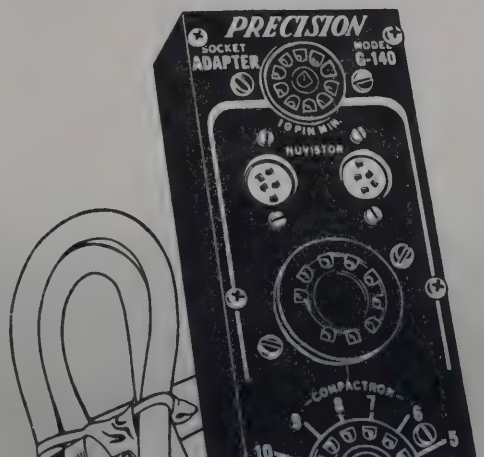
TUBE	SECT	A	B	C	D	E	LEVERS W	X	Y	Z	FIL CONT
6HA5 (6HQ5)		1	3	13	10	7	2	-	5	1	3-4
	(6HA5 - Must show short on 2-7)										
	(6HA5 - Cathode short test - depress 2-7 together)										
6HB5	Insert tube in socket with key at 0)										
"		3	1	3	17	7	-	2	7	3	1-12
	(6HB5 - Use red grid cap)										
6HB6		2	4	5	11	7	6	8	7	2	4-5
	(6HB6 - May show short on 3-6-8-9)										
	(6HB6 - Suppressor short test - depress 3-9 together)										
	(6HB6 - Screen short test - depress 6-8 together)										
6HB7	Tri	1	4	25	10	7	1	-	8	9	4-5
"	Pen	4	4	9	10	7	1	7	6	2	
	(6HB7 - Must show short on 1-3)										
	(6HB7 - Cathode short test - depress 1-3 together)										
6HC8	Tri	4	4	10	10	7	-	-	9	1	4-5
"	Pen	1	4	15	10	7	-	7	6	3	
6HE5	Insert tube in socket with key at 2										
"		1	1	35	10	7	12	5	8	4	1-3
	(6HE5 - Must show short on 5-12)										
	(6HE5 - Use red grid cap)										
6HF5	Insert tube in socket with key at 4										
"		1	3	0	4	7	2	7	12	9	3-5
	(6HF5 - Use red grid cap)										
	(6HF5 - Must show short on 1-2-7-8)										
	(6HF5 - Cathode short test - depress 1-8 together)										
	(6HF5 - Screen short test - depress 2-7 together)										
6HF8 (6GN8)	Tri	2	4	36	10	7	-	-	3	2	4-5
"	Pen	1	4	26	10	7	-	8	9	7	
6HG5		1	3	29	10	7	1	6	5	7	3-4
	(6HG5 - Must show short on 1-7)										
	(6HG5 - Grid short test - depress 1-7 together)										
6HJ8	Pen	1	4	11	22	7	-	3	6	2	4-5
"	Di	3	4	0	16	7	-	-	8	-	
6HK5		1	3	14	10	7	2	-	5	1	3-4
	(6HK5 - Must show short on 2-7)										
	(6HK5 - Cathode short test - depress 2-7 together)										

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
6HM5		2	3	25	14	7	2	-	5	1	3-4
	(6HM5 - Must show short on 2-7)										
	(6HM5 - Cathode short test - depress 2-7 together)										
6HR6		4	3	6	10	7	-	6	5	1	3-4
6HS6		1	3	15	19	7	-	6	5	1	3-4
6HT6		4	4	4	10	7	3	8	7	2	4-5
6HM6	(6HT6 - Must show short on 1-3)										
	(6HT6 - Cathode short test - depress 1-3 together)										
6HW8	Pl-1	4	4	5	20	7	-	3	8-9	6	4-5
"	Pl-2	4	4	5	20	7	-	3	1-2	6	
6HZ6		4	3	15	15	7	-	6	5	1	3-4
6J10	Insert tube in socket with key at 6										
"	Sec-1	1	5	21	11	7	-	8	2	4	5-7
"	Insert tube in socket with key at 0										
"	Sec-2	1	1	0	29	7	-	-	4-6	-	1-12
	(6J10 - Use red grid cap)										
6J11	Insert tube in socket with key at 2										
"	Pen-2	1	3	5	31	7	-	4	5	7	1-3
"	Insert tube in socket with key at 8										
"	Pen-1	1	9	5	31	7	-	2	4	6	7-9
6JB6		2	4	1	6	7	1-2	7	12	6	4-5
	(6JB6 - Must show short on 1-2-6-7)										
	(6JB6 - Screen short test - depress 1-7 together)										
	(6JB6 - Grid short test - depress 2-6 together)										
	(6JB6 - Red grid cap goes to top of tube)										
6JC6		1	4	5	20	7	3	8	7	2	4-5
~~6HM6~~	(6JC6 - Must show short on 1-3)										
	(6JC6 - Cathode short test - depress 1-3 together)										
6JC8	Tri	1	4	27	10	7	7	-	9	8	4-5
"	Pen	4	4	19	9	7	7	3	6	2	
	(6JC8 - Cathode short test - depress 1-7 together)										
6JD6		1	4	5	20	7	3	8	7	2	4-5
	(6JD6 - Must show short on 1-3)										
	(6JD6 - Cathode short test - depress 1-3 together)										

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
6JE6		3	4	0	17	7	1-2	7	12	6	4-5
	(6JE6 - Must show short on 1-2-6-7)										
	(6JE6 - Red grid cap goes to top of tube)										
6JG6		4	4	3	12	7	1	6	9	2	4-5
	(6JG6 - Must show short on 1-7)										
	(6JG6 - Screen short test - depress 1-7 together)										
6JH6		4	3	7	10	7	-	6	5	1	3-4
6JH8	Sec-1	4	4	18	19	7	-	3	9	6	4-5
"	Sec-2	4	4	18	20	7	-	3	8	6	
6JK6		1	3	9	16	7	-	6	5	1	3-4
6JK8	Di-1	1	4	23	10	7	-	-	6	7	4-5
"	Di-2	1	4	15	10	7	-	-	1	2	
6JL6		1	3	2	17	7	-	6	5	1	3-4
6JT6		1	4	2	5	7	1	7	9	2	4-5
	(6JT6 - Must show short on 1-7)										
	(6JT6 - Screen short test - depress 1-7 together)										
6JU8	Di-1	3	4	0	16	7	7	-	8	-	4-5
"	Di-2	3	4	0	16	7	-	-	7	-	
"	Di-3	3	4	0	16	7	1	-	2	-	
"	Di-4	3	4	0	16	7	-	-	1	-	
	(6JU8 - Must show short on 2-8)										
	(6JU8 - Cathode short test - depress 8-9 together)										
	(6JU8 - Cathode short test - depress 2-3 together)										
6JV8	Tri	4	4	4	9	7	-	-	3	2	4-5
"	Pen	4	4	3	10	7	-	8	9	7	
6JZ8	Insert tube in socket with key at 8										
"	Pen	2	7	7	7	7	1	3	12	2	7-9
	(6JZ8 - Must show short on 1-2)										
	(6JZ8 - Grid short test - depress 1-2 together)										
"	Insert tube in socket with key at 5										
"	Tri	2	4	30	10	7	-	-	7	2	4-6
	(6JZ8 - Use red grid cap)										

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
6K11	Insert tube in socket with key at 0										
"	Tri-2	1	1	33	10	7	-	-	5	7	1-12
"	Insert tube in socket with key at 5										
"	Tri-1	1	6	27	10	7	-	-	2	1	
"	Tri-3	1	6	33	10	7	-	-	7	3	
	(6K11 - Use red grid cap)										
6KA8	Tri	4	4	2	10	7	-	-	1	2	4-5
"	Pen	4	4	8	13	7	-	8	9	6	
6KD8	Tri	1	4	25	10	7	-	-	1	9	4-5
"	Pen	1	4	18	25	7	-	3	6	2	
6KE8	Tri	2	4	32	10	7	-	-	1	9	4-5
"	Pen	4	4	5	10	7	-	3	6	2	
6KL8	Pen	4	4	13	10	7	-	6	7	2	4-5
"	Di	3	4	0	27	7	-	-	8	-	
6KM8	Di	3	4	0	27	7	-	-	3	-	4-5
"	Tet-1	4	4	18	10	7	-	8	1	7	
"	Tet-2	4	4	19	10	7	-	8	2	7	
"	Tet-3	4	4	21	10	7	-	8	9	7	
6KV8	Tri	1	4	31	10	7	-	-	3	2	4-5
"	Pen	1	4	9	9	7	-	8	9	7	
6KZ8	Sec-1	4	4	9	10	7	-	7	6	2	4-5
"	Sec-2	3	4	15	18	7	-	-	1	9	
6LB8	Tri	1	4	18	10	7	-	-	3	2	4-5
"	Pen	2	4	7	18	7	-	8	9	7	
6LC8	Tri	1	4	29	10	7	-		1	2	4-5
"	Pen	4	4	8	16	7	-	8	9	6	
	(6LC8 - May show short on 3)										
6LF8	Tri	1	4	29	11	9	-	-	3	2	4-5
"	Pen	1	4	21	10	9	-	8	9	7	
6LM8	Tri	1	4	24	10	7	-	-	1	9	4-5
"	Pen	4	4	3	12	7	-	3	6	2	

BRING YOUR PRESENT TUBE TESTER
Up to date



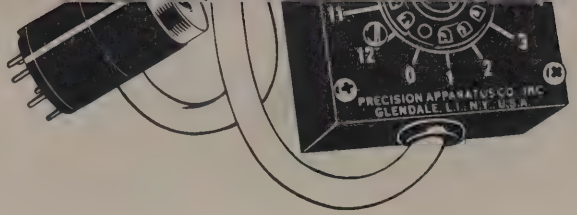
TEST THE NEW TUBES

- 10 Pin Min
- 12 Pin Compactron
- 5 Pin Nuvistor
- 7 Pin Nuvistor
- Novar Tubes

In your present tube checker

MODEL - G-140 ADAPTER

- A Multi-socket Adapter Unit which instantly modernizes any tube tester, for the test of: ● 12 pin Compactron Tubes ● 10 pin Miniature Tubes ● 5 and 7 pin Nuvistors ● Novar Types.



- The Adapter Cable simply plugs into the nine pin socket of the Tube Tester . . . the Tester's grid cap is attached and the Adapter is ready to operate.

- No complex switching required to adapt the 12 pin Compactron to Tube Testers which have less than 12 test circuits. Precision's unique Compactrons Keying System allows for complete test through simple tube Rotation.

NET PRICE: — $12.95

PRECISION APPARATUS, INC. **80-00 Cooper Ave. Bldg. #3** **Glendale 27, N.Y.**

ATT: — SUBSCRIPTION DEPT.

☐ Please enter my order for .....(quantity) Model G-140 Adapters, as described above, at $12.95 each.

☐ Enclosed find check or money order in the amount of.....

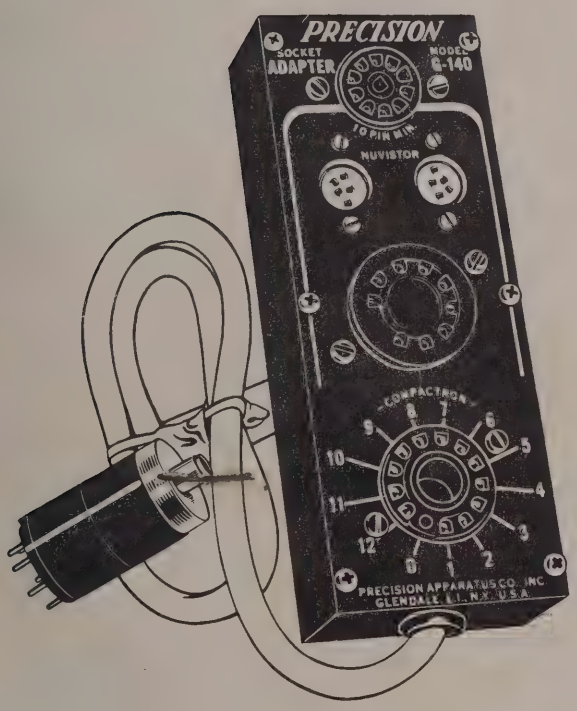
SHIP TO: — PLEASE PRINT YOUR NAME AND ADDRESS

NAME.....

STREET.....

CITY.....ZONE.....STATE.....

BRING YOUR PRESENT TUBE TESTER
Up to date



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STREET.....

CITY..... ZONE..... STATE.....

TUBE	SECT	A	B	C	D	E	LEVERS W	X	Y	Z	FIL CONT
6M11	Insert tube in socket with key at 0										
"	Tri-1	2	1	28	19	7	-	-	7	8	1-12
"	Tri-2	2	1	28	19	7	-	-	6	5	
"	Insert tube in socket with key at 4										
"	Pen	1	5	14	25	7	-	7	2	6	
	(6M11 - Use red grid cap)										
6Q11	Insert tube in socket with key at 5										
"	Tri-1	1	6	25	10	7	-	-	2	1	4-6
"	Tri-3	1	6	25	18	7	-	-	7	3	
"	Insert tube in socket with key at 2										
""	Tri=2	1	3	25	18	7	-	-	7	9	1-3
6T9	Insert tube in socket with key at 4										
"	Tri	1	3	32	10	7	-	-	6	8	3-5
"	Insert tube in socket with key at 8										
"	Pen	1	7	30	10	7	-	5	6	3	7-9
	(6T9 - Use red grid cap)										
6T10	Insert tube in socket with key at 0										
"		4	1	15	19	7	-	6	7	3	1-12
"	Insert tube in socket with key at 6										
"		5	7	2	10	7	-	3	4	1	5-7
	(6T10 - Use red grid cap)										
6U10	Insert tube in socket with key at 5										
"		1	4	27	10	7	-	-	2	1	4-6
"	Insert tube in socket with key at 0										
"		4	1	20	10	7	-	-	5	7	1-12
"	Insert tube in socket with key at 3										
"		5	2	28	10	7	-	-	5	1	4-2
	(6U10 - Use red grid cap)										
8B8	Tri	1	4	32	10	8	-	-	9	1	4-5
"	Pen	1	4	15	10	8	-	7	6	3	
8B10	Insert tube in socket with key at 0										
"	Tri-1	1	1	28	10	8	-	-	6	5	1-12
"	Tri-2	1	1	28	10	8	-	-	4	3	
"	Insert tube in socket with key at 6										
"	Di-1	3	7	0	16	8	-	-	3	-	
"	Di-2	3	7	0	16	8	-	-	1	-	
	(8B10 - Use red grid cap)										

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
8CL8	Tri	1	4	22	10	8	-	-	2	1	4-5
"	Tet	4	4	9	10	8	-	7	6	9	
8FQ7	Tri-1	1	4	19	14	8	-	-	6	7	4-5
"	Tri-2	1	4	19	14	8	-	-	1	2	
8HG8	Tri	1	4	5	10	8	-	-	7	6	4-5
"	Pen	1	4	7	25	8	-	9	8	2	
	(8HG8 - May show short on 1-3)										
	(8HG8 - Cathode short test - depress 1-3 together)										
8JK8	Di-1	1	4	23	10	8	-	-	6	7	4-5
"	Di-2	1	4	15	10	8	-	-	1	2	
8JV8	Tri	4	4	4	9	8	-	-	3	2	4-5
"	Pen	4	4	3	10	7	-	8	9	7	
8KA8	Tri	4	4	2	10	8	-	-	1	2	4-5
"	Pen	4	4	15	10	8	-	8	9	6	
8LC8	Tri	1	4	29	10	8	-	-	1	2	4-5
"	Pen	4	4	8	16	8	-	8	9	6	
	(8LC8 - May show short on 3)										
9A8	Tri	1	4	13	10	9	-	-	1	9	4-5
"	Pen	1	4	30	15	9	-	3	6	2	
9GV8	Tri	2	4	34	10	8	-	-	1	2	4-5
"	Pen	2	4	7	10	8	-	7	6	9	
9KZ8	Pen	4	4	9	10	9	-	7	6	2	4-5
"	Tri	3	4	15	18	9	-	-	1	9	
10AL11	Insert tube in socket with key at 2										
"	Pen-1	4	1	17	10	9	-	9	8	5	1-3
"	Insert tube in socket with key at 6										
"	Pen-2	4	5	2	10	9	-	3	4	1	5-7
	(10AL11 - Use red grid cap)										
10DX8	Tri	1	4	31	10	9	-	-	2	1	4-5
"	Pen	1	4	26	11	9	-	9	6	8	
10EM7	Tri-1	4	7	12	10	9	-	-	5	4	7-8
"	Tri-2	2	7	0	8	9	-	-	2	1	

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
10GF7	Tri-1	5	4	27	10	9	-	-	8	9	4-5
"	Tri-2	2	4	2	10	7	-	-	6	2	
10GN8	Tri	4	4	9	10	9	-	-	3	2	4-5
"	Pen	1	4	18	10	9	-	8	9	7	
10HF8	Tri	2	4	36	10	9	-	-	3	2	4-5
"	Pen	1	4	26	10	9	-	8	9	7	
10JA8	Tri	2	4	35	10	9	-	-	3	2	4-5
"	Tet	2	4	12	15	9	-	8	9	7	
10JY8	Tri	5	4	13	9	9	-	-	3	2	4-5
"	Pen	1	4	24	9	9	-	8	9	7	
10KU8	Di-1	3	4	-	24	9	2	-	3	-	4-5
"	Di-2	3	4	-	24	9	3	-	2	-	
"	Pen	1	4	9	8	9	-	8	9	7	
10LB8	Tri	5	4	18	10	9	-	-	3	2	4-5
"	Pen	2	4	7	18	9	-	8	9	7	
11AR11	Insert tube in socket with key at 2										
"	Pen-2	1	3	7	30	9	-	5	4	7	3-1
"	Insert tube in socket with key at 8										
"	Pen-1	1	9	7	30	9	-	4	3	5	9-7
	(11AR11 - Use red grid cap)										
11KV8	Tri	1	4	31	10	9	-	-	3	2	4-5
"	Pen	1	4	9	9	9	-	8	9	7	
12AJ7		1	2	6	26	10	-	6	8	4	2-7
12AL11	Insert tube in socket with key at 2										
"	Pen-1	4	1	17	10	10	-	9	8	5	1-3
"	Insert tube in socket with key at 6										
"	Pen-2	4	5	2	10	10	-	3	4	1	5-7
	(12AL11 - Use red grid cap)										
12AU8	Pen	2	4	8	24	10	-	8	9	7	4-5
"	Tri	2	4	15	25	10	-	-	3	2	
12AX3	Insert tube in socket with key at 5										
"		1	4	0	4	10	2	-	9	-	4-6
	(12AX3 - Must show short on 2-9)										
	(12AX3 - Plate short test - depress 2-9 together)										
	(12AX3 - Use red grid cap)										

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
12AY3		1	4	0	4	10	2	-	7	-	4-5
	(12AY3 - Must show short on 2-7)										
	(12AY - Plate short test - depress 2-7 together)										
12BE3	Insert tube in socket with key at 2										
"		3	1	0	16	10	12	-	6	-	1-3
	(12BE3 - Use red grid cap)										
	(12BE3 - Must show short on 6-12)										
	(12BE3 - Plate short test - depress 6-12 together)										
12BT3	Insert tube in socket with key at 0										
"		3	1	0	17	10	-	-	4	-	1-12
	(12BT3 - Use red grid cap)										
12DM4		1	7	-	4	10	-	-	5	-	7-8
12FV7	Di-1	2	5	17	10	10	-	-	6	7	4-5-9
"	Di-2	2	4	17	10	10	-	-	1	2	
12FX5		2	3	13	9	10	5	6	7	2	3-4
	(12FX5 - Must show short on 2-5)										
	(12FX5 - Grid #1 - short test - depress 2-5 together)										
12GE5	Insert tube in socket with key at 5										
"		5	6	7	7	10	8-9	-	7-12	3	4-6
	(12GE5 - Red grid cap goes to G-140 stud)										
	(12GE5 - Grid short test - depress 3-8 together)										
	(12GE5 - Cathode short test - depress 2-9 together)										
	(12GE5 - Must show short on 2-3-8-9)										
12GJ5		1	4	2	5	10	1-12	7	12	6	4-5
	(12GJ5 - Must show short on 1-2-6-7)										
	(12GJ5 - Grid short test - depress 2-7 together)										
	(12GJ5 - Screen short test - depress 1-6 together)										
12GT5		2	4	6	7	10	1-2	-	7-9	6	4-5
	(12GT5 - Must show short on 1-2-6-7)										
	(12GT5 - Grid short test - depress 2-6 together)										
	(12GT5 - Screen short test - depress 1-7 together)										
12JB6		2	4	1	6	10	1-2	7	12	6	4-5
	(12JB6 - Must show short on 1-2-6-7)										
	(12JB6 - Screen short test - depress 1-7 together)										
	(12JB6 - Grid short test - depress 2-6 together)										
	(12JB6 - Red grid cap goes to top of tube)										

TUBE	SECT	A	B	C	D	E	LEVERS W	X	Y	Z	FIL CONT
12JT6		1	4	2	5	10	1	7	9	2	4-5
	(12JT6 - Must show short on 1-7)										
	(12JT6 - Screen short test - depress 1-7 together)										
12JZ8	Insert tube in socket with key at 8										
"	Pen	2	7	7	7	10	1	3	12	2	7-9
	(12JZ8 - Must show short on 1-2)										
"	Insert tube in socket with key at 5										
"	Tri	2	4	30	10	10	-	-	7	2	4-6
	(12JZ8 - Use red grid cap)										
12KA8	Tri	4	4	2	10	10	-	-	1	2	4-5
"	Pen	4	4	15	10	10	-	8	9	6	
12KL8	Pen	4	4	13	10	10	-	6	7	2	4-5
"	Di	3	4	0	27	10	-	-	8	-	
13CM5		2	2	1	7	10	1	4	12	5	2-7
	(13CM5 - Must show short on 1-3-4-8)										
	(13CM5 - Cathode short test - depress 3-8 together)										
	(13CM5 - Screen short test - depress 1-4 together)										
	(13CM5 - Use red grid cap)										
13CW4		5	4	9	10	10	-	-	1	2	4-5
13FM7	Insert tube in socket with key at 6										
"		4	5	0	23	10	1	-	4	9	5-7
"	(13FM7 - Must show short on 1-9)										
	(13FM7 - Grid short test - depress 1-9 together)										
"	Insert tube in socket with key at 2										
"		2	3	0	10	7	-	-	7	5	1-3
	(13FM7 - Use red grid cap)										
13GB5		3	4	2	16	10	*	6	12	1	4-5
	*(13GB5 - Lever W - 2-7-8)										
	(13GB5 - Must show short on 1-2-3-6-7-8)										
	(13GB5 - Screen short test - depress 6-7 together)										
	(13GB5 - Cathode short test - depress 3-8 together)										
	(13GB5 - Red grid cap goes to top of tube)										
13GF7	Tri-1	5	4	27	10	13	-	-	8	9	4-5
"	Tri-2	2	4	2	10	7	-	-	6	2	

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
13J10	Insert tube in socket with key at 6										
"	Pen-1	1	5	21	11	10	-	8	2	4	5-7
"	Insert tube in socket with key at 0										
"	Pen-2	1	1	0	29	10	-	-	4-6	-	1-12
	(13J10 - Use red grid cap)										
14JG8	Di-1	3	4	0	16	10	-	-	2	-	4-5
"	Di-2	3	4	0	17	10	-	-	6	-	
"	Tri	2	4	35	10	10	-	-	9	8	
15A6		4	4	3	10	10	-	1	7	2	4-5
15AF11	Insert tube in socket with key at 7										
"	Pen	4	8	2	10	10	-	4	9	5	6-8
"	Insert tube in socket with key at 2										
"	Di-1	4	1	2	10	10	-	-	6	5	1-3
"	Insert tube in socket with key at 0										
"	Di-2	4	1	2	10	10	-	-	8	6	1-12
	(15AF11 - Use red grid cap)										
15AQ3		1	4	0	4	10	3-8	-	9	-	4-5
	(15AQ3 - May show short on 1-2-3-6-7-8-9)										
15BD11	Insert tube in socket with key at 0										
"	Tri-1	4	1	2	10	10	-	-	8	6	1-12
"	Tri-2	4	1	2	10	10	-	-	4	3	
"	Insert tube in socket with key at 5										
"	Pen	4	4	3	10	10	-	2	7	3	4-6
	(15BD11 - Use red grid cap)										
15CW5		1	4	2	10	10	1-6-8	9	7	2	4-5
	(15CW5 - May show short on 1-2-6-7-8-9)										
	(15CW5 - Grid short test - depress 1-2 together)										
	(15CW5 - Plate short test - depress 7-8 together)										
	(15CW5 - Screen short test - depress 6-9 together)										
15DQ8	Tri	1	4	26	10	10	-	-	2	1	4-5
"	Pen	1	4	15	13	10	-	9	6	8	
15FM7	Insert tube in socket with key at 6										
"	Tri-1	4	5	0	23	10	1	-	4	9	5-7
"	(15FM7 - Must show short on 1-9)										
	(15FM7 - Grid short test - depress 1-9 together)										
"	Insert tube in socket with key at 2										
"	Tri-2	2	3	0	10	7	-	-	7	5	1-3
	(15FM7 - Use red grid cap)										

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
15FY7	Insert tube in socket with key at 5										
"	Tri-1	4	4	15	10	10	-	-	3	2	4-6
"	Insert tube in socket with key at 2										
"	Tri-2	1	1	0	9	10	-	-	7	5	1-3
15HB6		2	4	5	11	10	6	8	7	2	4-5
	(15HB6 - May show short on 3-6-8-9)										
	(15HB6 - Suppressor short test - depress 3-9 together)										
	(15HB6 - Screen short test - depress 6-8 together)										
16GK6		1	4	21	10	11	-	8	7	2	4-5
	(16GK6 - Must show short on 3-9)										
	(16GK6 - Suppressor short test - depress 3-9 together)										
16GY5	Insert tube in socket with key at 4										
"		3	3	3	15	10	2	7	11	9	3-5
	(16GY5 - Must show short on 1-2-7-8)										
	(16GY5 - Screen short test - depress 2-7 together)										
	(16GY5 - Cathode short test - depress 1-8 together)										
	(16GY5 - Black grid cap goes to top of tube)										
17AX3	Insert tube in socket with key at 5										
"		1	4	0	4	11	2	-	9	-	4-6
	(17AX3 - Must show short on 2-9)										
	(17AX3 - Plate short test - depress 2-9 together)										
	(17AX3 - Use red grid cap)										
17AY3		1	4	0	4	11	2	-	7	-	4-5
	(17AY3 - Must show short on 2-7)										
	(17AY3 - Plate short test - depress 2-7 together)										
17B4		1	2	40	4	11	-	-	3	5	2-7
17BE3	Insert tube in socket with key at 2										
"		3	1	0	16	11	12	-	6	-	1-3
	(17BE3 - Use red grid cap)										
	(17BE3 - Must show short on 6-12)										
	(17BE3 - Plate short test - depress 6-12 together)										
17BF11	Insert tube in socket with key at 0										
"	Pen-1	4	1	21	15	11	-	6	7	3	1-12
"	Insert tube in socket with key at 8										
"	Pen-2	1	7	5	10	11	-	5	6	3	7-9
	(17BF11 - Use red grid cap)										

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
17BH3		1	4	0	4	11	2	-	7	-	4-5
	(17BH3 - Must show short on 2-7)										
	(17BH3 - Plate short test - depress 2-7 together)										
	(17BH3 - Use red grid cap)										
17C9	Tet-1	4	4	5	9	10	-	8	9	7	4-5
"	Tet-2	3	4	9	23	10	-	2	3	1	
	(17C9 - Use red grid cap)										
17DM4		1	7	-	4	11	-	-	5	-	7-8
17GE5	Insert tube in socket with key at 5										
"		5	6	7	7	11	8-9	7	12	3	4-6
	(17GE5 - Must show short on 2-3-8-9)										
	(17GE5 - Grid short test - depress 3-8 together)										
	(17GE5 - Cathode short test - depress 2-9 together)										
	(17GE5 - Use red grid cap)										
17GJ5		1	4	2	5	11	1-2	7	12	6	4-5
	(17GJ5 - Must show short on 1-2-6-7)										
	(17GJ5 - Grid short test - depress 2-7 together)										
	(17GJ5 - Screen short test - depress 1-6 together)										
17GT5		2	4	6	7	11	1-2	-	7-9	6	4-5
	(17GT5 - Must show short on 1-2-6-7)										
	(17GT5 - Grid short test - depress 2-6 together)										
	(17GT5 - Screen short test - depress 1-7 together)										
17GV5	Insert tube in socket with key at 4										
"		2	5	1	9	11	2	7	12	9	3-5
	(17GV5 - Must show short on 1-2-7-8)										
	(17GV5 - Cathode short test - depress 1-8 together)										
	(17GV5 - Screen short test - depress 2-7 together)										
	(17GV5 - Red grid cap goes to top of tube)										
17GW6		3	2	0	17	10	-	4	11	5	2-7
17HC8	Tri	4	4	10	10	10	-	-	9	1	4-5
"	Pen	1	4	15	10	7	-	7	6	3	
17JB6		2	4	1	6	11	1-2	7	12	6	4-5
	(17JB6 - Must show short on 1-2-6-7)										
	(17JB6 - Screen short test - depress 1-7 together)										
	(17JB6 - Grid short test - depress 2-6 together)										
	(17JB6 - Red grid cap goes to top of tube)										

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
17JG6		4	4	3	12	10	1	6	9	2	4-5
	(17JG6 - Must show short on 1-7)										
	(17JG6 - Screen short test - depress 1-7 together)										
17JK8	Di-1	1	4	23	10	10	-	-	6	7	4-5
"	Di-2	1	4	15	10	10	-	-	1	2	
17JT6		1	4	2	5	11	1	7	9	2	4-5
	(17JT6 - Must show short on 1-7)										
	(17JT6 - Screen short test - depress 1-7 together)										
17JZ8	Insert tube in socket with key at 8										
"	Pen	2	7	7	7	11	1	3	12	2	7-9
	(17JZ8 - Must show short on 1-2)										
	(17JZ8 - Grid short test - depress 1-2 together)										
"	Insert tube in socket with key at 5										
"	Tri	2	4	30	10	11	-	-	7	2	4-6
	(17JZ8 - Use red grid cap)										
17W6		1	2	10	5	10	-	4	3	5	2-7
18GV5	Insert tube in socket with key at 4										
"		2	5	1	9	11	2	7	12	9	3-5
	(18GV5 - Must show short on 1-2-7-8)										
	(18GV5 - Red grid cap goes to top of tube)										
19HR6		4	3	6	10	11	-	6	5	1	3-4
19HS6		1	3	15	19	11	-	6	5	1	4-5
19JN8	Pen	1	4	15	22	11	-	7	6	9	4-5
"	Tri	2	4	15	18	11	-	-	2	1	
19KG8	Tri	1	4	19	10	11	-	-	1	2	4-5
"	Pen	4	4	8	10	11	-	7	6	9	
21GY5	Insert tube in socket with key at 4										
"		3	3	3	15	11	2	7	11	9	3-5
	(21GY5 - Must show short on 1-2-7-8)										
	(21GY5 - Screen short test - depress 2-7 together)										
	(21GY5 - Cathode short test - depress 1-8 together)										
	(21GY5 - Black grid cap goes to top of tube)										
21HB5	Insert tube in socket with key at 0										
"		3	1	3	17	11	-	2	7	3	1-12
	(21HB5 - Use red grid cap)										

TUBE	SECT	A	B	C	D	E	LEVERS W	X	Y	Z	FIL CONT
22BH3		1	4	0	4	12	2	-	7	-	4-5
	(22BH3 - Must show short on 2-7)										
	(22BH3 - Plate short test - depress 2-7 together)										
	(22BH3 - Use red grid cap)										
22JG6		4	4	3	12	11	1	6	9	2	4-5
	(22JG6 - Must show short on 1-7)										
	(22JG6 - Screen short test - depress 1-7 together)										
26JG6		4	4	3	12	12	1	6	9	2	4-5
	(26JG6 - Must show short on 1-7)										
	(26JG6 - Screen short test - depress 1-7 together)										
27GB5		3	4	2	16	12	*	6	12	1	4-5
	*(27GB5 - Lever W - 2-7-8)										
	(27GB5 - Must show short on 1-2-3-6-7-8)										
	(27GB5 - Grid short test - depress 1-2 together)										
	(27GB5 - Screen short test - depress 6-7 together)										
	(27GB5 - Cathode short test - depress 3-8 together)										
	(27GB5 - Red grid cap goes to top of tube)										
28GB5		3	4	2	16	12	*	6	12	1	4-5
	*(28GB5 - Lever W - 2-7-8)										
	(28GB5 - Grid short test - depress 1-2 together)										
	(28GB5 - Screen short test - depress 6-7 together)										
	(28GB5 - Cathode short test - depress 3-8 together)										
	(28GB5 - Red grid cap goes to top of tube)										
	(28GB5 - Must show short on 1-2-3-6-7-8)										
33GT7	Insert tube in socket with key at 4										
"	Di	3	3	0	15	13	-	-	6	-	3-5
"	Pen	3	3	2	17	13	-	1	9	2	
	(33GT7 - Use red grid cap)										
33GY7	Insert tube in socket with key at 3										
"	Di	3	4	0	15	13	-	-	5	-	2-4
"	Insert tube in socket with key at 4										
"	Pen	3	3	2	18	13	-	2	9	1	3-5
	(33GY7 - Use red grid cap)										
35C3		3	3	0	16	13	-	-	5	-	3-4
50BM8	Tri	2	4	32	10	14	-	-	9	1	4-5
"	Pen	2	4	9	10	14	-	7	6	3	

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
5896	Di-1	1	3	0	5	7	-	-	5	-	3-6
"	Di-2	1	3	0	5	7	-	-	1	-	
5933		7	1	20	10	7	-	2	12	3	1-5
	(5933 - Use red grid cap)										
6085	Tri-1	1	9	27	10	7	-	-	1	2	4-5-9
"	Tri-2	1	9	27	10	7	-	-	6	7	
6094		4	3	5	8	7	6-7-9	2	4	1	3-5
	(6094 - Must show short on 1-2-4-6-7-9)										
6216A		1	4	5	8	7	6	7	1	2	4-5
	(6216A - Must show short on 1-3-6-8)										
	(6216A - Plate short test - depress 1-6 together)										
	(6216A - Cathode short test - depress 3-8 together)										
CK-6526		4	5	6	9	2	-	2	1	4	3-5
6686		4	4	4	9	7	1	8	7	2	4-5
7119	Tri-1	1	8	27	5	7	-	-	9	7	4-5-8
"	Tri-2	1	8	27	5	7	-	-	1	2	
7586		3	4	21	16	7	-	-	1	2	4-5
7802	Tri-1	2	7	2	9	7	-	-	2	1	7-8
"	Tri-2	2	7	3	9	7	-	-	5	4	
7868		1	4	14	10	7	6-7	1	9	2	4-5
	(7868 - Will show short on 1-2-6-7)										
	(7868 - Grid short test - depress 2-6 together)										
	(7868 - Suppressor short test - depress 1-7 together)										
7984	Insert tube in socket with key at 7										
"		2	6	0	7	10	1	5	12	4	6-8
	(7984 - Must show short on 2-3-9-1-5)										
	(7984 - Cathode short test - depress 2-3-9 together)										
	(7984 - Screen short test - depress 1-5 together)										
	(7984 - Use red grid cap)										
8056		3	4	2	20	7	-	-	1	2	4-5

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
8106		1	4	25	9	10	•	3	1	7	4-5
	(8106 - Must show short on 2-3-6-8-9)										
	(8106 - Cathode short test - depress 2-6-9)										
	(8106 - Grid short test - depress 3-8 together)										
	•(8106 - Throw levers 6-8-9 to "W")										
8113		5	3	5	10	7	2	6	5	1	3-4
	(8113 - Must show short on 2-7)										
	(8113 - Cathode short test - depress 2-7 together)										
8156	Insert tube in socket with key at 4										
"		2	5	7	10	10	6-7-8	2	9	1	3-5
	(8156 - Must show short on 6-7-8-9-12)										
	(8156 - Cathode short test - depress 6-12 together)										
	(8156 - Plate short test - depress 7-8-9 together)										
	(8156 - Use red grid cap)										
8203		3	4	19	16	7	-	-	1	2	4-5
8441		5	4	12	10	7	-	-	1	2	4-5
8532		1	3	33	6	7	1-5	-	7	6	3-4
	(8532 - Must show short on 1-5-6)										
	(8532 - Grid short test - depress 1-5-6 together)										
	FOREIGN										
DK-40		2	1	17	34	2	-	-	3	4	1-8
DL-95		1	5	27	15	2	2	4	6	3	1-5-7
	(DL-95 - Must show short on 2-6)										
E-80CC	Tri-1	1	9	27	10	7	-	-	1	2	4-5-9
"	Tri-2	1	9	27	10	7	-	-	6	7	
E-81L		4	4	4	9	7	1	8	7	2	4-5
E-182CC	Tri-1	1	8	27	5	7	-	-	9	7	4-5-8
"	Tri-2	1	8	27	5	7	-	-	1	2	
ECF-83	Tri	3	4	15	17	7	-	-	3	2	4-5
"	Pen	4	4	10	10	7	-	7	6	9	
ECL-85	Tri	2	4	34	10	7	-	-	1	2	4-5
"	Pen	2	4	7	10	7	-	7	6	9	

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
EL-13		1	2	25	10	7	-	6	5	7	2-3
EL-82		1	4	7	10	7	-	9	7	2	4-5
EL-500		3	4	2	16	7	*	6	12	1	4-5

*(EL-500 - Lever W - 2-7-8)
(EL-500 - Must show short on 1-2-3-6-7-8)
(EL-500 - Grid short test - depress 1-2 together)
(EL-500 = Screen short test - depress 6-7 together)
(EL-500 - Cathode short test - depress 3-8 together)
(EL-500 - Red grid cap goes to top of tube)

EY-87	CAUTION:-Levers 5-8 must be thrown to position "W" before inserting tube and must remain in position "W" throughout all tests, including short tests.										
"		7	2	0	14	7	5-8	-	11	-	*

*(EY-87 - Fil Cont - must show short on 1-2-4-6-9)

LCL-84	Tri	1	4	31	10	9	-	-	2	1	4-5
"	Pent	1	4	26	11	9	-	9	6	8	
PL-83		4	4	3	10	10	-	1	7	2	4-5
PL-84		1	4	2	10	10	1-6-8	9	7	2	4-5

(PL-84 - May show short on 1-2-6-7-8-9)
(PL-84 - Grid short test - depress 1-2 together)
(PL-84 - Plate short test - depress 7-8 together)
(PL-84 - Screen short test - depress 6-9 together)

PL-500		3	4	2	16	12	2-7-8	6	12	1	4-5

(PL-500 - Must show short on 1-2-3-6-7-8)
(PL-500 - Cathode short test - depress 3-8 together)
(PL-500 - Grid short test - depress 1-2 together)
(PL-500 - Screen short test - depress 6-7 together)
(PL-500 = Use red grid cap)

UCF-12	Tri	1	2	27	10	11	-	-	5	4	2-3
"	Pen	4	2	13	14	11	-	6	1	7	
UCL-82	Tri	2	4	32	10	14	-	-	9	1	4-5
"	Pen	2	4	9	10	14	-	7	6	3	
XCL-82	Tri	1	4	32	10	8	-	-	9	1	4-5
"	Pen	1	4	15	10	8	-	7	6	3	
XCL-85	Tri	2	4	34	10	8	-	-	1	2	4-5
"	Pen	2	4	7	10	8	-	7	6	9	

TUBE	SECT	A	B	C	D	E	W	LEVERS X	Y	Z	FIL CONT
	The following tube types are corrected listings. Please make necessary corrections on roll chart and main supplement book.										
1K3		4	2	0	20	2	8	-	11	-	2-7
	(1K3 - May show short on 1-3-5) (1K3 - Black grid cap goes to cap of tube)										
1S5	Pen	1	7	8	39	4	-	4	5	6	1-7
"	Di	3	7	0	30	2	-	-	3	-	
2E41	Pen	5	4	5	38	2	-	2	1	5	4-6
"	Di	3	4	0	45	2	-	-	3*	-	
	*(2E41 - Place 6000 ohm res. in series with diode plate lead #3 to reduce current drain)										
2E42	(See 2E41)										
4BL8	Tri	1	4	14	10	6	-	-	1	9	4-5
"	Pen	1	4	23	16	6	-	3	6	2	
5CL8	Tri	1	4	22	10	6	-	-	2	1	4-5
"	Tet	4	4	9	10	6	-	7	6	9	
6CL8	Tri	1	4	~~22~~ 32	~~10~~ 7	7	-	-	2	1	4-5
"	Tet	4	4	~~9~~ 25	~~10~~ 7	7	-	7	6	9	
6DE6		1	3	12	26	7	-	6	5	1	3-4
6DQ6		1	2	0	4	7	-	4	11	5	2-7
12DQ6		1	2	0	4	10	-	4	11	5	2-7
17DQ6		1	2	0	4	11	-	4	11	5	2-7
25DQ6		1	2	0	4	12	-	4	11	5	2-7
31A3		2	1	0	3	13	6	-	2	-	1-8
	(31A3 - Fil Cont - Set control "E" at 12)										
7058	Tri-1	1	4	12	32	10	9	-	6	7	4-5
"	Tri-2	1	4	12	32	10	9	-	1	2	
ECF-80	Tri	1	4	14	10	7	-	-	1	9	4-5
"6057	Pen	1	4	23	16	7	-	3	6	2	
UY-41		2	1	0	3	13	6	-	2	-	1-8
	(UY-41 Fil Cont - set control "E" at 12)										

TM 11-1209

WAR DEPARTMENT TECHNICAL MANUAL

TEST SET I-157-A

(TUBE AND SET TESTER PRECISION MODEL 920P)

WAR DEPARTMENT • NOVEMBER 1944

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TM 11-1209, Test Set I-157-A, is published for the information and guidance of all concerned.

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BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

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IBn 11: T/O-E 11-400(A) Sign AW Orgn Bn Hq

IC 4: T/O-E 4-260-1 Hq and Hq Btry (HD)
IU 4: T/O-E 4-232 CA Sector Commands
4-240 CA Sub Sector Commands

IC 11: T/O 11-107, Sig Dep Co
11-237, Sig Co SV GP
11-592, Hq & Hq Co Sig Base Dep
11-587, Sig Base Maint Co
11-597, Sig Base Dep Co
11-617, Sig Radar Maint Unit
11-400, Sig AW Orgn (B) Co Hq Team
11-400, Sig AW Orgn, Radar Rep Plat (C)
11-287, Sig Co Dep Avn
11-500, Sig SV Orgn (EC) Radar Maint Team (EG)
Radar Repair Sec

IC 44: T/O 44-138 AAA SL Btry

(For explanation of symbols see FM 21—6.)

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DESTRUCTION NOTICE

WHY — To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN — When ordered by your commander.

HOW — 1. Smash — Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

2. Cut — Use axes, handaxes, machetes.

3. Burn — Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

4. Explosives — Use firearms, grenades, TNT.

5. Disposal — Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

WHAT — 1. Smash — Meter, knobs, controls, switches, tube, lamps, pushbutton assembly, wooden cabinet, tube sockets.

2. Cut — Cables, wiring.

3. Burn — Technical manuals, roller chart, schematic diagrams, cabinet, transformer, cables and wiring.

4. Bend — Panel.

5. Bury or scatter — All of the above pieces after destroying their usefulness.

DESTROY EVERYTHING

WARNING

HIGH VOLTAGE

is used in the operation of
the radio equipment.

DEATH ON CONTACT

may result if personnel fail
to observe safety precautions.

Be careful to avoid contact with high-voltage circuits or 115-volt a-c input connections while checking or servicing the radio equipment. Make certain that the power is turned off before disassembling any part of the radio equipment.

Dangerously high voltages are present in the power supplies of the radio equipment. Before making any service checks, manually discharge all high-voltage capacitors in these circuits after the a-c power has been removed from the components.

FIRST AID TREATMENT FOR ELECTRIC SHOCK

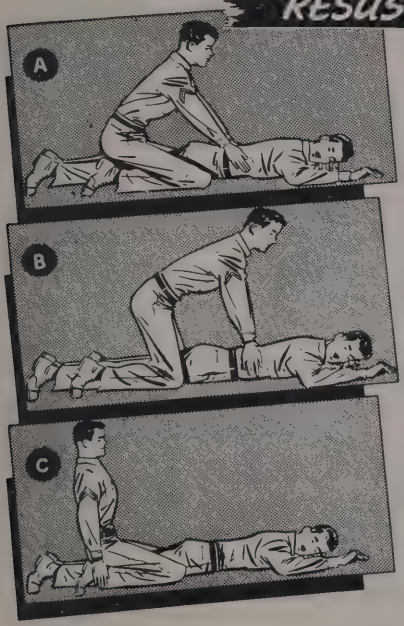
I. FREE THE VICTIM FROM THE CIRCUIT IMMEDIATELY.

Shut off the current. If this is not immediately possible, use a dry nonconductor (rubber gloves, rope, board) to move either the victim or the wire. Avoid contact with the victim. If necessary to cut a live wire, use an axe with a dry wooden handle. Beware of the resulting flash.

II. ATTEND INSTANTLY TO THE VICTIM'S BREATHING.

Begin resuscitation at once on the spot. Do not stop to loosen the victim's clothing. Every moment counts. Keep the patient warm. Wrap him in any covering available. Send for a doctor. Remove false teeth or other obstructions from the victim's mouth.

RESUSCITATION



POSITION

1. Lay the victim on his belly, one arm extended directly overhead, the other arm bent at the elbow, the face turned outward and resting on hand or forearm, so that the nose and mouth are free for breathing (fig. A).

2. Straddle the patient's thighs, or one leg, with your knees placed far enough from his hip bones to allow you to assume the position shown in figure A.

3. Place your hands, with thumbs and fingers in a natural position, so that your palms are on the small of his back, and your little fingers just touch his lowest ribs (fig. A).

FIRST MOVEMENT

4. With arms held straight, swing forward slowly, so that the weight of your body is gradually brought to bear upon the victim. Your shoulders should be directly over the heels of your hands at the end of the forward swing (fig. B). Do not bend your elbows. The first movement should take about 2 seconds.

SECOND MOVEMENT

5. Now immediately swing backward, to remove the pressure completely (fig. C).

6. After 2 seconds, swing forward again. Repeat this pressure-and-release cycle 12 to 15 times a minute. A complete cycle should require 4 or 5 seconds.

CONTINUED TREATMENT

7. Continue treatment until breathing is restored or until there is no hope of the victim's recovery. Do not give up easily. Remember that at times the process must be kept up for hours.

8. During artificial respiration, have someone loosen the victim's clothing. Wrap the victim warmly; apply hot bricks, stones, etc. Do not give the victim liquids until he is fully conscious. If the victim must be moved, keep up treatment while he is being moved.

9. At the first sign of breathing, withhold artificial respiration. If natural breathing does not continue, immediately resume artificial respiration.

10. If operators must be changed, the relief operator kneels behind the person giving artificial respiration. The relief takes the operator's place as the original operator releases the pressure.

11. Do not allow the revived patient to sit or stand. Keep him quiet. Give hot coffee or tea, or other internal stimulants.

HOLD RESUSCITATION DRILLS REGULARLY

TL 37451

Figure 1. Tube and set tester, Precision model 920P.

SECTION I
DESCRIPTION

1. GENERAL.

Precision model 920P tube and set tester (Test Set I-157-A) is a push-button-operated radio tube tester combined with a rotary range-selector system for obtaining measurements of a-c and d-c voltages, resistances, decibels, and d-c currents on 33 ranges. The instrument also provides a direct-reading test for batteries, a test for pilot lights, and a system for obtaining qualitative analysis of mica, paper, and electrolytic capacitors.

a. The tube-analyzer circuit of this instrument makes use of a special testing system to check in one operation the two most important electrical characteristics of a radio tube, namely, *mutual conductance* and *cathode emission.* An automatic, interlocking, push-button element selector, incorporated in the analyzer, provides for simplicity of operation, visible filament-continuity tests, quick interelement short checks, cathode leakage checks, and rapid location of all tube elements for the application of individual test voltages.

b. The rotary range-selector system provides a rapid method of obtaining the following measurements:

(1) A-c and d-c voltage measurements in six ranges from zero to 3,000 volts at 1,000-ohms-per-volt sensitivity.

(2) D-c current measurements in five ranges from zero to 12 amperes.

(3) Resistance measurements in four ranges from zero to 10 megohms.

(4) Output voltage readings in six ranges from zero to 3,000 volts.

(5) Decibel readings in six ranges from —10 to +64 decibels.

(6) D-c current-leakage measurements in electrolytic capacitors.

c. The direct-reading, battery-testing circuit is designed to accommodate all conventional, portable-radio, A-, B-, and C- batteries from 1.5 through 135 volts in 11 calibrated steps.

2. TUBE-ANALYZING FEATURES.

a. This test instrument provides all filament voltages from 1.4 to 110 volts. It tests the following tubes: loktals, bantam juniors, bantams, single-ended tubes, regular octals (MG, G, and metal types), spray-shield and glass types, and miniature, seven-prong tubes.

773453 O - 48 - 2

b. Tube-merit indications are read directly on a three-colored English-reading scale. These readings are: REPLACE for tubes that test bad; WEAK for tubes that are questionable; and GOOD for tubes in proper operating condition.

c. A roller tube chart with a double window provides quick tube references.

d. Dual, free-point, filament terminal selection locates terminals of all filaments (single, double, center-tapped, and tapped), regardless of any rotating pin positions.

e. A visible filament continuity test shows open filaments in all types of tubes regardless of filament base connections. This feature eliminates delay by immediately determining whether or not the filament of a tube under test is intact.

f. The interlocking push-button selector system affords extreme flexibility for free-point tube analysis. It also insures the accommodation of future tube releases.

g. Specific individual loads and voltages (control grid, screen, plate, etc.) are applied to the respective elements of a tube under test.

h. A varying a-c signal is applied to control grids.

i. The meter is located in the plate circuit of the tube; therefore, indications are entirely dependent upon the control action of all intervening elements.

j. The tube test immediately indicates tubes with open elements, since all elements must be intact in order to obtain a proper reading.

k. The instrument tests diodes, triodes, rectifiers, tetrodes, pentodes, multipurpose tubes, gaseous types 0Z3 and 0Z4, and remote-control gaseous types 0A4 and 2A4, regardless of varying filaments or other element positions.

l. Individual tests are provided for each section of multisection tubes including visible tests of the fluorescent screen and winking effect on cathode-ray indicator tubes. No shifting of the tubes is necessary in making all tests.

m. A hot cathode-leakage test uses a sensitive neon method that quickly shows up poor cathode structure in accord with leakage specifications of tube manufacturers.

n. Hot interelement short tests are made simple through the use of the interlocking push-button selector system.

o. Noise test pin jacks are incorporated for earphone or amplifier connection. Each element can be separately tested for noise through the use of the push-button selector system.

p. A pilot light test is available for all miniature screw-base and bayonet-base type lamps.

q. The accuracy of the tube test circuit is closely maintained by the individual calibrating controls, which are adjusted against laboratory standards and sealed at the factory.

r. A large, ruggedly constructed, square-type meter is used. The scale is divided into three wide, colored sections marked REPLACE-WEAK-GOOD for tube merit indication.

s. All tube selection references are plainly marked on the panel.

t. Accurate line adjustment, read directly on the meter, is provided by the use of a variable, heavy-duty, line voltage control. The power line plug is a fused type containing two 1-ampere fuses. A pilot light on-off indicator is used.

u. Telephone-cabled, wax-impregnated wiring is used throughout the instrument.

3. SET-ANALYZING FEATURES.

The following set analyzing features are incorporated in the rotary range-selector system.

a. A-c voltage measurements are obtained on six voltage ranges at 1,000-ohms-per-volt sensitivity. The six a-c voltage ranges are: 0-12, 0-60, 0-300, 0-600, 0-1,200, and 0-3,000 volts.

b. D-c voltage measurements are also obtained on six voltage ranges at 1,000-ohms-per-volt sensitivity. These six ranges are the same as those listed in subparagraph **a** above.

c. D-c current measurements are obtained on five current ranges. Four of these ranges provide the following milliampere measurements: 0-1.2, 0-12, 0-120, and 0-600; the fifth range gives measurements from 0-12 amperes.

d. Resistance is measured on four ranges; namely, 0-400 ohms (20 ohms center) shunt method, 0-100,000 ohms (800 ohms center), 0-1 megohm (8,000 ohms center), 0-10 megohms (80,000 ohms center). All of these ohmmeter ranges are powered by a self-contained power supply. A 4.5-volt battery powers the low, medium, and 1-megohm ranges. The a-c supply line furnishes the power for the 10-megohm range.

e. Decibel readings are obtained on six ranges, extending from —10 to +64 db.

f. Output voltage measurements are obtained on the six a-c voltage ranges, which extend from zero to 3,000 volts.

g. A sensitive neon method is used to perform leakage tests on paper and mica capacitors.

h. Leakage measurements on all types of electrolytic capacitors are read directly on the meter in terms of current per microfarad.

i. The master range-selector system permits the use of only two polarized pin jacks to obtain all measurements and tests, except for the 1,200-volt, 3,000-volt, and 12-ampere ranges.

j. The meter shunts are wire-wound to 1 percent accuracy on impregnated moistureproof bobbins. The metallized multipliers are matched to 1 percent accuracy.

k. The large D'Arsonval-type meter has an accuracy of 2 percent for d-c measurements and 3 percent for a-c measurements. The base sensitivity of the meter is 400 microamperes at 160 millivolts.

l. Large easy-reading numbers and scales are used. The a-c correction scale and the decibel scale are printed in red.

m. The accuracy of the a-c voltage and decibel ranges is closely maintained through individual calibrating controls, which are adjusted against laboratory standards and sealed at the factory.

4. BATTERY-TESTING FEATURES.

a. A specially designed switching circuit permits each battery to be tested under load in order to simulate actual operating conditions under which the battery functions in the radio set.

b. The 11 ranges are accurately calibrated so that batteries will be definitely rejected when their *loaded* terminal voltage no longer meets the stability requirements of the component in which they are used.

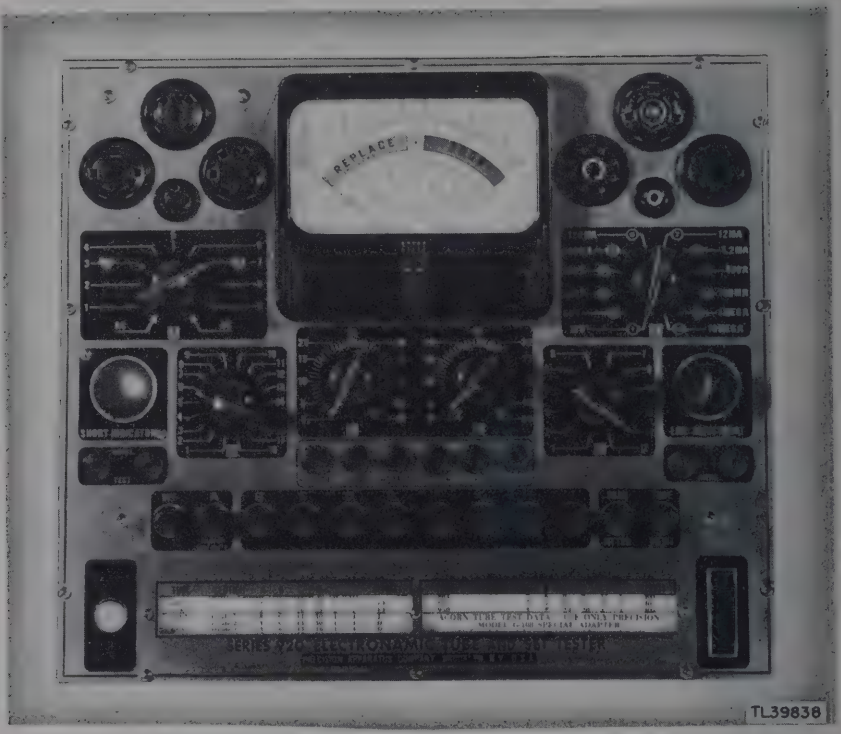


Figure 2. Instrument panel, close-up.

SECTION II

OPERATION

5. TUBE TEST (fig. 2).

a. Preparatory Steps. Complete instructions for turning the instrument on, and the preparatory steps that must be performed prior to testing a tube are as follows:

(1) With the OFF button depressed, connect the fused line plug of the instrument to any 50/60-cycle, 110/125-volt a-c source.

(2) Refer to the tube test roller chart for the tube number required and set rotary controls *A, B, C, D, E,* and *F* to the positions designated for the particular tube under test. For simplicity in locating any tube type number, all tubes are listed in strict numerical order beginning at the top of the left-hand window opening, continuing downward to the end of the roll, and then to the top of the right-hand window opening and down to the end of the roll.

(3) Lightly press the double-action TUBE MERIT button to turn the instrument on. This button will remain in the normal "up" position. The on-off indicator light should glow, indicating that power is being supplied to the instrument. Within a few seconds a reading will be obtained on the meter.

NOTE: In the event that the TUBE MERIT button is accidentally fully depressed, then LINE indication will not be obtained. To disengage this button, depress the OFF button (which releases *any* previously depressed buttons). Also, LINE indication on the meter will be obtained *only* when control *A* is set to the tube test positions 1 through 9.

(4) Rotate the LINE ADJUSTMENT knob to bring the pointer of the meter to the position marked LINE, indicated by the arrowhead in the center of the scale.

(5) Insert the tube to be tested into the proper socket and allow it to heat for a few seconds. Correct indication depends upon proper operating temperaure. Attach the overhead cap connector when the tube has a topcap. Any deviation of the meter pointer from the LINE position must be corrected at this time by readjusting the LINE ADJUSTMENT knob to return the meter pointer to the arrowhead (center of scale). This completes the preparatory steps and operations for testing the tube can now be performed.

b. Filament Continuity, Hot Cathode Leakage, and Interelement Short Tests. To perform these tests, depress lettered push buttons *A, B, C, D,*

E, F, G, H, and *J* in consecutive order and watch the neon lamp SHORT INDICATOR for a glow or a continuous flicker. Closely observe the following instructions:

(1) Neon lamp indication will be obtained *only* on push-button *A,* FILAMENT CONTINUITY, or whatever other button or buttons may be designated on the tube chart for filament continuity.

(2) Inasmuch as the filament of the tube under test is disengaged when the FILAMENT CONTINUITY button is depressed, return the button to the normal position immediately after indication to allow the tube to remain in a heated condition for further tests. This can be done by depressing any other push button. The tube under test should be rejected as defective (open filament) if the neon lamp fails to glow when the FILAMENT CONTINUITY button is depressed.

(3) Disregard any *momentary* neon lamp flashes when the push buttons are depressed. These flashes are merely the discharge of a capacitor in the short-check circuit.

(4) When manipulating the lettered push buttons while making filament-continuity, cathode-leakage, and interelement-short tests, the TUBE MERIT button must remain in its normal or "up" position. This permits tests on individual elements of the tube, and provides automatic release of each previously depressed button thereby permitting only one button at a time to be in the down position.

(5) A discernible neon lamp glow or continuous flickering when any one of the other lettered buttons *B* to *J* is depressed indicates an interelectrode high-resistance leakage or short in the tube under test. Reject the tube without further testing unless otherwise noted on the tube-test roller chart.

(6) While making combined cathode-leakage and interelement short tests, tap the tube with the fingers as each of the lettered buttons is depressed. Always allow enough time for the tube to heat sufficiently so that shorts or leakages that may occur because of expansion of internal elements can be more readily detected.

(7) Since all tube elements connect to individual lettered push-buttons, a separate cathode-leakage button is not necessary. Cathode leakage will be detected when the respective button corresponding to the cathode of a particular tube is depressed.

c. Audible Noise Test. An audible noise test of defective and noisy tubes can be made as follows:

(1) Insert a headset (or audio amplifier system) into the NOISE TEST tip jacks.

(2) Depress consecutively each of the lettered push buttons *B* to *J.* As each button is depressed, listen carefully for an audible indication.

(3) An intermittent or constant loud hum as the push buttons are depressed indicates loose or shorted tube elements. *A loud hum is normal when the FILAMENT CONTINUITY button is depressed and indicates a continuous filament.*

d. Tube Quality Indication. This test gives an indication of the merit of the tube. Make certain that the line adjustment is correct and that all controls are set at their respective positions for the tube under test; then proceed as follows:

(1) *Fully* depress the TUBE MERIT button to the lock-in position.

(2) Depress one at a time *only those lettered push buttons designated on the tube-test roller chart for that paricular tube.*

NOTE: In the event that the wrong lettered push button is depressed, depress the OFF button which also functions as a general release button. This action disengages and returns all buttons up to the normal position. This same procedure is followed after testing a tube when it is desired to continue the test procedure on another tube or another section of the tube under test.

(3) After depressing the designated buttons, depress and hold down the READ METER button to obtain a tube quality indication on the meter. When obtaining a tube quality indication, tap the tube under test with the fingers. At times such tapping may cause a noticeable meter pointer fluctuation. This fluctuation indicates loose internal element structure which may cause a noisy, fading condition when the tube is operating in the radio set.

CAUTION: Do not attempt to obtain tube-quality meter indication until after short tests are made; otherwise the instrument may be damaged.

e. Diode Test Indication. When testing that section of a tube identified by the word "diode", as noted on the tube roller chart, note the arrow line with the small letters marked DIODES in the red REPLACE sector of the scale. A *good* diode reading is indicated if the meter pointer reaches anywhere beyond this line even though the pointer still remains in the REPLACE sector. A *poor* diode reading is indicated if the pointer of the meter does not reach the line marked DIODES.

f. Multisection Tube Tests. Full-wave rectifiers and multisection tubes such as double triodes, triode-diodes, pentode-diodes, duo-diodes, frequency converters, pentode-triodes, and pentode-rectifiers contain either a second plate, a second triode, or other combination of sections. These tubes are designated on the tube chart where each of these sections is separately described and the settings given. Treat each of these sections as if testing individual tubes for tube quality (subpar. **d** above) by setting the controls and lettered push buttons designated for each section. The circuit used in this instrument permits testing of the individual sections of multisection tubes. Give this type of

tube a complete test, therefore, since one poor section will hinder proper operation in the radio set.

g. Gas-type Rectifiers OZ3 and OZ4. When testing gas-type rectifiers, it will be noted that the meter pointer remains for a short interval in the REPLACE sector and then deflects into the GOOD sector. This condition is normal for a good gas rectifier. Should the meter pointer remain constantly in the REPLACE sector after a lapse of several seconds, the gas rectifier can be considered defective.

h. Visible-eye Tests. (1) As noted on the tube-test roller chart, the tube test circuit features provide two visible fluorescent screen (eye) tests aside from the regular triode section test. These tests are:

(*a*) Visible indications of the fluorescent screen.

(*b*) Open and close effect of the shadow section.

(2) Upon completion of the triode section test, reset the controls for the eye section test and *fully* depress the TUBE MERIT button. Depress the first button noted on the chart, and then depress the READ METER button for a quality indication. A visible luminous screen should be obtained when the READ METER button is depressed. With the READ METER button still held down, depress the second button noted on the chart to obtain the closing eye effect. *Disregard meter indications on eye tests.*

i. 70A7 and 117N7 Rectifier Test. Because of unusual internal connections, the 70A7 and 117N7 rectifier sections require a special test procedure. Button *A* or buttons *A* and *E* together, as noted on the tube chart, must be depressed simultaneously with the READ METER button. Normal meter indication will be obtained for a few seconds but will then gradually recede because the 70A7 and 117N7 filament connections must necessarily be isolated from the test circuit to provide merit indication for the rectifier section. Rectifier merit is therefore to be judged only by the initial meter deflection. Buttons *A* and *E* must be immediately returned to normal position if it is desired to keep the filaments of the tube under test in a heated condition.

j. Special Roller Chart Notations. Certain tube types are accompanied by notations such as "OK over ¼ of scale" or "OK over 1/3 of scale." These notations on the chart signify that even though the meter pointer may fall within the red REPLACE sector, the tube is not to be rejected unless the pointer falls *below* the sections of the scale noted.

k. Tube Brand Variations. The tube test limits for this instrument have been determined by checking thousands of tubes in the production run of all tube types of all leading tube manufacturers. From the information so gathered, the data on the roller chart accompanying this instrument has been compiled. Inasmuch as extensive and intensive research is constantly being made in the radio tube industry to improve and stabilize the electrical and mechanical

construction of tubes, it is not uncommon for a tube manufacturer to make a change in the specifications of a particular tube. This change, though not necessarily immediately noticeable in radio set performance, may be made to improve tube stability and prolong its life. The change may, however, indicate itself on the tube tester and necessitate a new set of test limits for that particular type number produced by the manufacturer who has made the change. Therefore, should a particular type number of a given manufacturer be found to vary consistently from the assigned average roller chart limits, merely redetermine the new average setting of control *D* required to pass these tubes at approximately the center of the letter "G" of the word GOOD in the green sector of the scale. Record this information for future reference as regards type and manufacture. It can readily be seen that a consistently low or high reading for any particular tube type of a definite manufacturer is not to be taken as indicative of a poor or better run of tubes, nor as a defect in the tube tester.

6. PILOT LIGHT TEST (fig. 2).

The miniature-base socket located in the center of the combination seven-prong tube socket accommodates all miniature screw- and bayonet-base type pilot lamps. The test procedure is as follows:

a. With the OFF button depressed, connect the line plug of the instrument into a 50/60-cycle, 110/125-volt a-c source.

b. Set control *A* to position 2.

c. Set control *F* to position 1.

d. Select the proper filament voltage with control *B*. This is done by rotating the control to the correct setting in the same manner as when obtaining filament voltages for the various tubes. Each setting furnishes a definite voltage, the value of which can be determined by consulting the tube roller chart and noting the setting of control *B* for specific tube filament voltages

e. Turn the instrument ON by lightly pressing the TUBE MERIT button.

f. Rotate the LINE ADJUSTMENT knob to bring the pointer of the meter to the position marked LINE in the center of the meter scale.

g. Insert the pilot lamp into the receptacle in the center of the combination seven-prong socket. If the lamp is good, it will glow normally. Make certain the base of the bulb makes proper contact within the receptacle.

7. PAPER AND MICA CAPACITOR TEST (fig. 2).

The center pin of the bantam junior socket, located at the upper left-hand side of the panel, is used in conjunction with either one of the NOISE TEST pin jacks to make paper and mica capacitor tests using the neon lamp as a

quality indicator. The instrument power supply furnishes the necessary rectified voltage to the capacitor, the polarity of which need not be observed. The test procedure is described below:

a. Connect the instrument line plug to a 50/60-cycle, 110/125-volt a-c source.

b. Set control *A* to position 1.

c. Turn the instrument ON by lightly pressing the TUBE MERIT button.

d. Rotate the LINE ADJUSTMENT knob to bring the pointer of the meter to the position marked LINE in the center of the meter scale.

e. *Fully* depress the TUBE MERIT button to the lock-in position.

f. Insert the test leads into the jacks noted above, and apply the free ends across the terminals of the capacitor under test while observing the indications on the neon glow lamp. These indications will be as follows:

(1) A steady glow of the neon lamp indicates a low d-c resistance or a short-circuited capacitor.

(2) A flickering of the neon lamp indicates a high-resistance leakage condition.

(3) No indication on the neon lamp signifies that the capacitor under test is open, or that the capacity is too small to cause the neon lamp to register visibly.

(4) A good capacitor causes an instantaneous neon lamp flash, the duration of which is dependent upon the capacity of the unit under test. The greater the capacity, the longer the duration of the flash and vice versa.

NOTE: The NOISE TEST pin jacks may not accommodate the insulated type of test-lead tips as employed on conventional test leads. It may be necessary to use the standard phone tips found on headset leads in order to reach the deep-set open-circuiting contacts.

CAUTION: Always disconnect the instrument line plug from the a-c supply source when making *any* of the measurements that follow, except when employing the 0-10 megohm range. Also, control *A* must be set to the AC or DC position before using the rotary selector switch.

8. A-C VOLTAGE MEASUREMENTS (fig. 2).

The complete instructions for obtaining a-c voltage measurements with this instrument are given below.

a. Set control *A* to the AC position for all a-c voltage measurements.

b. Select the proper voltage range on the range selector. If the approximate value of the voltage is unknown, always use the highest range on the meter

first; then determine and select the most suitable range for the greatest accuracy in measurement. This precaution protects the meter rectifier, since a slight overload will damage it or change its characteristics.

c. Insert the test leads into the two pin jacks marked EXT. TEST and apply the test prods across the circuit under test.

d. Read the a-c voltage measurements on the *red a-c correction scale* as follows:

(1) Zero to 12 volts; read directly.

(2) Zero to 60 volts; read directly.

(3) Zero to 300 volts; read directly.

(4) Zero to 600 volts; read on the 0-60 scale and multiply by 10.

(5) Zero to 1,200 volts; read on the 0-12 scale and multiply by 100.

(6) Zero to 3,000 volts; read on the 0-300 scale and multiply by 10.

NOTE: All a-c and d-c voltage measurements are made from the two EXT. TEST pin jacks except 1,200 and 3,000 volts. To use these two ranges, set the range selector (control *F*) to the 600-volt position, then insert the negative test lead into the minus (—) EXT. TEST jack and the positive test lead into either the +1200V. or the +3000V pin jack.

9. D-C VOLTAGE MEASUREMENTS (fig. 2).

The complete instructions for obtaining d-c voltage measurements are given below.

a. Set control *A* to the DC position for all d-c voltage measurements.

b. Select the proper voltage range on the range selector. If either the polarity or the approximate value of the voltage is unknown, always use the highest range on the meter; then determine and select the most suitable range for the greatest accuracy in measurement.

c. Insert the test leads into the two pin jacks marked EXT. TEST and apply the test prods across the circuit under test. *Observe polarity.*

d. Read the d-c voltage measurements on the black scales as follows:

(1) Zero to 12 volts; read directly.

(2) Zero to 60 volts; read directly.

(3) Zero to 300 volts; read directly.

(4) Zero to 600 volts; read on the 0-60 scale and multiply by 10.

(5) Zero to 1,200 volts; read on the 0-12 scale and multiply by 100.

(6) Zero to 3,000 volts; read on the 0-300 scale and multiply by 10.

10. D-C CURRENT MEASUREMENTS (fig. 2).

All current measurements except those on the 0-12 ampere range are made from the EXT. TEST pin jacks. The 12-ampere range is available only at the two separate + and — 12 AMPS. pin jacks located on the lower right section of the panel directly below the LINE ADJUSTMENT control. The range selector (control *F*) must be in the 600 MA position in order to use the 12 AMPS. pin jacks. All current measurements are made with the test leads in series with the load. Observe the proper polarity when connecting the test leads. Instructions for obtaining current measurements are given below.

CAUTION: When using the 12-ampere range, never remove the test leads from the pin jacks on the instrument while current is flowing through the circuit. Failure to observe this precaution will result in arcing and charring at the jacks.

a. Set control *A* to the DC position for all d-c current measurements.

b. Select the proper current range on the range selector. If the polarity or approximate value of the current is unknown, always use the highest current range on the meter; then determine and select the most suitable range for the greatest accuracy in measurement.

c. Insert the test leads into the proper pin jacks and connect the test prods *in series* with the load under test. This will necessitate opening the circuit in order to connect the test leads. *Always observe polarity.*

d. Read all current measurements on the black d-c scale as follows:

(1) Zero to 1.2 milliamperes; read on the 0-12 scale and divide by 10.

(2) Zero to 12 milliamperes; read on the 0-12 scale.

(3) Zero to 120 milliamperes; read on the 0-12 scale and multiply by 10.

(4) Zero to 600 milliamperes; read on the 0-60 scale and multiply by 10.

(5) Zero to 12 amperes; read directly on the 0-12 scale.

11. RESISTANCE MEASUREMENTS (fig. 2).

All resistance measurements are made with control *A* in the DC position. *Make certain that all electric power has been removed from the circuit under test.* When possible, disengage one end of the resistance from the circuit before making the measurement. This is advisable because other resistances may be in shunt with the unit under test, thereby causing a false reading. Three of the four resistance ranges are powered by a 4.5-volt battery located on the inside of the carrying case. When full-scale deflection of the meter pointer can no longer be obtained, this battery must be replaced. Complete instructions for the operation of the four resistance ranges follow.

a. Zero to 400-ohm (Low-ohms) Range. The low-ohms circuit uses the

shunt method (back-up scale) for low-resistance measurements. This produces an immediate meter pointer deflection when the range selector is set to the 400-ohm position with the test leads not shorted. To take resistance measurements on this range, proceed as follows:

(1) Set control *A* to the DC position.

(2) Set control *F* to the 400-ohm position.

(3) Rotate control *C* (ohms adjust control) to bring the meter pointer to *exactly* full-scale (LO) deflection.

(4) Insert the test leads into the two pin jacks marked EXT. TEST and apply the test prods across the resistance to be measured.

(5) Read the low-ohms resistance measurements on the 0-400 scale. Indications for this scale start from the left.

> **CAUTION:** Never allow the range selector to remain in the 400-ohm position when the low-ohms range is not being used; otherwise, a continuous current will be drawn from the ohmmeter battery, even when the instrument is being used for tube testing. The range selector may be set to any other position without affecting the battery.

b. Zero to 100,000-ohm Range. The procedure for making resistance measurements with this range is as follows:

(1) Set control *A* to the DC position.

(2) Set control *F* to the 100M position.

(3) Insert the test leads into the two pin jacks marked EXT. TEST.

(4) Short the test prods together, and rotate control *C* to bring the meter pointer to *exactly* full-scale deflection.

(5) Apply the test prods across the resistance to be measured.

(6) Read the indication directly on the 0-100M scale.

c. Zero to 1-megohm Range. The procedure for making resistance measurements with this range is as follows:

(1) Set control *A* to the DC position.

(2) Set control *F* to the 1 MEG Ω position.

(3) Insert the test leads into the two pin jacks marked EXT. TEST.

(4) Short the test prods together, and rotate control *C* to bring the meter pointer to *exactly* full-scale deflecion.

(5) Apply the test prods across the resistance to be measured.

(6) Read the indication on the 0-100M scale and multiply by 10 to obtain the correct result.

d. Zero to 10-megohm Range. This range is powered by the tester power

supply; therefore, it is necessary to connect the line plug to a source of electric power. The complete procedure is as follows:

(1) With the OFF button depressed, connect the line plug of the instrument to any 50/60-cycle, 110/125-volt a-c source.

(2) Set control *A* to the DC position.

(3) Set control *F* to the 10 MEG Ω position.

(4) Insert the test leads into the two pin jacks marked EXT. TEST.

(5) Lightly depress the TUBE MERIT button to turn the instrument on.

(6) Short the test prods together, and rotate the LINE ADJUSTMENT knob to bring the meter pointer to *exactly* full-scale deflection.

(7) Apply the test prods across the resistance to be measured.

(8) Read the indication on the 0-100M scale and multiply by 100 to obtain the correct result.

12. OUTPUT VOLTAGE MEASUREMENTS (fig. 2).

Two methods can be used to obtain output voltage measurements. In the first method, the test leads are connected across the voice coil of the speaker, or the secondary of the output transformer of the radio set. If these points are not easily accessible, the test leads are connected from the plate of the output tube to ground (or chassis) with a good quality capacitor in series with one of the leads to block the d-c plate voltage. This capacitor should have a value of 0.25 mf with a working voltage rating of 600 volts d-c or higher, depending upon the maximum d-c voltage on the plate of the tube. If the d-c plate voltage is greater than 600 volts, the voltage rating of the capacitor should be comparable to the value of d-c voltage appearing on the plate of the tube. In addition to its use as an output indicator, the output meter can also be used to great advantage for making comparisons in tube performances under actual operating conditions. This is done by noting the difference in meter indications when any or all of the tubes are substituted in the radio set under test. The procedure for obtaining output voltage measurements is as follows:

a. Set control *A* to the AC position for all output voltage measurements.

b. Select the proper voltage range on the range selector. If the approximate value of the voltage is unknown, always use the highest range on the meter first; then determine and select the most suitable range for the greatest accuracy of indication. The voltage ranges used for output voltage measurements are the same ranges that are used for a-c voltage measurements (par. 8).

c. Insert the test leads into the jacks marked EXT. TEST.

d. Turn on the radio set under test and introduce a strong signal into its input. Allow the set to heat for a few minutes.

e. Connect the test leads across either of the previously mentioned test points. Use care when connecting to the plate of the output tube to avoid electric shock. The best method of making this connection is to turn the radio set *off*, connect the test leads across the tube plate and ground, and then turn on the radio set.

f. Read the output voltage indication on the *red a-c correction scale* that applies to the range selected.

13. DECIBEL MEASUREMENTS (fig. 2).

A calibrated and direct-reading decibel scale enabling readings from —10 to +64 db is incorporated in this instrument. The initial meter scale reading (—10 to +16 db) is based upon a zero level of 6 milliwatts or 1.73 volts across a 500-ohm load, 500 ohms being the load most commonly used in audio work. The most common use of a decibel meter is as a power level indicator across known impedances. Because of calibration at one definite impedance, conversions must be made to the new impedance when the meter is used with other than a 500-ohm load. Caution must be observed when using the decibel meter to insure the isolation of all d-c voltage from the meter circuit; otherwise the meter may be damaged or, at the least, erroneous readings obtained. D-c voltage can be isolated by inserting a blocking capacitor in series with one of the test leads as explained in paragraph 12 above. The decibel ranges on the meter correspond to the a-c voltage ranges, the difference being that decibel indications are read on the special decibel scale. For example, the first a-c voltage range (0-12 volts) corresponds to the initial db range (—10 to +16 db) as read on the initial db scale on the meter. The second a-c voltage range (0-60 volts) corresponds to the second db range (+4 to +30 db), etc. The method of using the decibel meter is as follows:

a. Set control *A* to the AC position for all decibel readings.

b. Select the proper db range on the range selector in the same manner as in the selection of the a-c voltage ranges to which the decibel ranges correspond.

c. Insert the test leads into the jacks marked EXT. TEST with a capacitor in series with one lead to block any d-c voltage.

d. Connect the free ends of the test leads across the 500-ohm load.

e. Read the decibel indications on the decibels scale as follows:

(1) Minus 10 to plus 16 db, 12-volt range, read directly on the initial db scale.

(2) Plus 4 to plus 30 db, 60-volt range, read on the initial db scale and add 14 db.

(3) Plus 18 to plus 44 db, 300-volt range, read on the initial db scale and add 28 db.

(4) Plus 24 to plus 50 db, 600-volt range, read on the initial db scale and add 34 db.

(5) Plus 30 to plus 56 db, 1,200-volt range, read on the initial db scale and add 40 db.

(6) Plus 38 to plus 64 db, 3,000-volt range, read on the initial db scale and add 48 db.

14. LEAKAGE-CURRENT MEASUREMENTS ON ELECTROLYTIC CAPACITORS.

a. General. All electrolytic capacitors contain an inherent d-c current leakage. The quality of an electrolytic capacitor can be determined by measuring the d-c current through the capacitor when a rated d-c voltage is applied and determining the amount of leakage in milliamperes per microfarad. When leakage current above a certain allowable value is present, the capacitor must be removed from the circuit and replaced with a good one. The allowable value of current leakage is dependent upon such factors as manufacturers' specifications, length of service, and the design of the power unit and filter system of the radio set in which the capacitor is used. In general, considering an 8-mf capacitor (rated at 450 volts d-c) that has been in operation over a period of time, the maximum allowable leakage current is approximately 0.5 milliampere per microfarad, or a total leakage current through the capacitor of 4 milliamperes. Before taking leakage-current measurements on a capacitor, first check it with the ohmmeter for a shorted condition. This is done by using the 0-100,000-ohm range in the set tester. Polarities must be observed when making this short test. The negative test lead is connected to the outside can, or negative terminal, and the positive test lead is connected to the anode, or positive terminal, of the capacitor under test. A low resistance reading or constant full-scale deflection of the meter pointer indicates that the capacitor is shorted and is to be rejected without further testing. A large amount of current is drawn through an electrolytic capacitor when voltage is first applied. This current gradually decreases until it reaches its normal steady value after about 3 minutes. It is therefore necessary to insert a current-limiting resistor in series with one of the test leads when the meter is connected into the circuit of the capacitor under test. The value of this resistor is approximately 5,000 ohms when the value of applied voltage exceeds 100 volts, and 1,000 ohms when the value of the applied voltage is less than 100 volts. This limiting resistor is very important and must not be omitted. Methods for taking leakage-current measurements on capacitors incorporated in a radio set, as well as for those not connected in a circuit, are given below.

b. Current Measurements on Capacitor in Radio Set. (1) Disconnect the *positive* terminal of the capacitor from the circuit. Make certain that all electrical power has been removed from the circuit under test.

(2) To check the capacitor for a shorted condition, set the tester to the 0-100,000-ohm range and apply the test prods to the terminals of the capacitor. Observe polarity.

(3) Set control *A* to the DC position.

(4) Set the range selector to the 120 MA range.

(5) Insert the test leads into the two EXT. TEST jacks with the proper limiting resistor (depending upon voltage) in series with the positive lead.

(6) Connect the positive test lead of the meter to the high-voltage lead which was disconnected from the positive terminal of the capacitor.

(7) Connect the negative test lead of the meter to the positive terminal of the capacitor. When the above connections are made, the set tester, capacitor, and limiting resistor are all in series with the voltage source.

(8) Turn on the radio set. The meter pointer will deflect to nearly full scale and then gradually recede to, or nearly to, the zero mark after about 3 minutes. This process is called "forming the capacitor."

(9) A steady meter pointer indication without receding to or near the zero mark after approximately 3 minutes, indicates a shorted or excessively leaky capacitor which should be rejected without further testing.

(10) After the "forming" process is completed, short-circuit the limiting resistor in the test lead and read the value of the leakage current through the capacitor directly on the 120 MA scale. If the meter indication is under 12 milliamperes, set the range selector to the 12 MA position for a more accurate reading on the 0-12 meter scale. The following data will serve as a basis for computing approximate maximum allowable current leakages:

(*a*) For capacitors rated at 300 volts or more, the allowable leakage current is approximately 0.5 milliampere per microfarad.

(*b*) For capacitors rated between 100 and 300 volts, the allowable leakage current is approximately 0.2 milliampere per microfarad.

(*c*) For capacitors rated below 100 volts, the allowable leakage current is approximately 0.1 milliampere per microfarad.

> **CAUTION:** After the test is completed, always first disconnect the negative test lead from the circuit before turning off the electric power in order to prevent slamming of the meter pointer by the discharge of the capacitor under test.

c. Current Measurements on Capacitor Not Incorporated in Set. To test electrolytic capacitors not incorporated in a radio set, an external d-c power supply is necessary, preferably one that employs a number of output voltage taps suitable for application to the various d-c voltage ratings of capacitors. The test procedure follows:

(1) Check the capacitor for a shorted condition as described in subparagraph **b** (2) above.

(2) Perform the operations outlined in subparagraphs **b** (3) to (5) above in order to prepare the instrument for the test.

(3) Connect the positive test lead to the positive tap on the power supply. Make certain that the proper limiting resistor is in series with the test lead.

(4) Connect the negative terminal of the capacitor to the negative tap on the power supply.

(5) Connect the negative test lead to the positive terminal of the capacitor. As will be observed, these connections place the set tester, capacitor, and limiting resistor in series with the power source.

(6) Refer to subparagraphs **b** (8) through (10) above to obtain the current leakage measurements. Observe the caution subparagraph **b** (10) above before turning off the power after the test has been completed.

15. BATTERY TEST.

An ordinary voltmeter test on a battery is entirely inadequate and misleading because the terminal voltage of used batteries differs greatly between the load conditions of actual service and the conditions caused by the negligible current drain of the usual 1,000-ohms-per-volt (or even more sensitive) voltmeter. Accordingly, a 3-volt battery may read a full 3 volts on a voltmeter, but the terminal voltage may drop to 1 volt when the battery is subjected to actual operating conditions in the radio set. Batteries can be quickly and accurately tested by this test instrument using the method oulined below. When testing batteries used in the ohmmeter circuits of test equipment, the battery may test "GOOD" but, nevertheless, not give full-scale deflection when used in the ohmmeter circuit. The reason for this is that the rejection point of ohmmeter batteries is considerably above that for radio receivers, test oscillators, and similar equipment. The ohmmeter battery is considered unusable when full scale adjustment of the meter pointer can no longer be obtained. When making tests on batteries the test instrument must be disconnected from the power line. The procedure for testing batteries is as follows:

a. Set control *A* to position 1.

b. Set control *B* to position 18.

c. Set control *F* to position 11.

d. Control *E,* which serves as the combination voltage and load selector, is set to the required positions as follows:

(1) Position 1 to test 1.5-volt batteries.

(2) Position 2 to test 3-volt batteries.

(3) Position 3 to test 4.5-volt batteries.

(4) Position 4 to test 6-volt batteries.

(5) Position 5 to test 7.5-volt batteries.

(6) Position 6 to test 9-volt batteries.

(7) Position 7 to test 22.5-volt batteries.

(8) Position 8 to test 45-volt batteries.

(9) Position 9 to test 67.5-volt batteries.

(10) Position 10 to test 90-volt batteries.

(11) Position 11 to test 135-volt batteries.

NOTE: Position 12 is not used.

e. Insert the test leads into the two pin jacks marked BATTERY TEST and apply the test prods to the terminals of the battery. *Observe polarity.* If the battery terminals are not identified as to polarity or voltage, refer to the receiver or to the battery manufacturer's data sheets for proper identification before testing, in order to prevent damage to the meter.

f. Indication of the condition of the battery is read on the REPLACE-WEAK-GOOD scale on the meter. Replace all batteries that show a reading in the REPLACE or the WEAK sector of the scale.

SECTION III

FUNCTIONING OF PARTS

16. GENERAL.

The functioning of each control, switch, and part incorporated on the panel of the tube and set tester is considered in this section (fig. 2). Study the following information carefully in order to facilitate operation of the instrument and to obtain greater accuracy in tube and set testing.

a. Control A. This control serves a double purpose as follows:

(1) When rotated to a given position from 1 to 9, it selects the control grid of the particular tube under test regardless of the pin position of the element. It also allows line-check meter indication when in any of these positions.

(2) When set to either the AC or DC position, the analyzing facilities of the meter are available from the polarized test jacks.

b. Control B. This control selects the correct filament voltage for the tube under test and provides a complete range of operating potentials from 1.4 through 110 volts. The control may be set to any one of 18 positions numbered from 1 to 18. The proper filament voltages are applied when the control is set according to the roller chart data listed under column **B.**

c. Control C. This is a dual potentiometer and serves the following double purpose:

(1) When testing tubes, this control provides a variable a-c signal which is automatically applied to the control grid selected by control *A.*

(2) When the set tester is being used as an ohmmeter, this control is used as an ohmmeter adjustment for the first three resistance ranges.

d. Control D. This is a special tapered potentiometer. When tube analyses are taken, this control functions as a variable meter shunt enabling the setting of calibration limits for all tubes as noted on the tube-test roller chart.

e. Control E. This control is primarily a screen-grid selector. Its major function is to select the screen grid of multi-element tubes (regardless of element pin position) and simultaneously to apply the correct screen voltage and load. Control **E** also provides for the following:

(1) Correct voltages and loads for general-purpose triodes.

(2) Correct voltages and loads for testing rectifiers and diodes.

(3) Correct voltages and loads for testing the gaseous types OZ3 and OZ4 rectifiers.

(4) Proper circuit connections for obtaining visible test of the fluorescent screens of all cathode-ray tuning indicators.

(5) Correct voltage and load selector when testing batteries.

f. Control F. This control serves a dual purpose as follows:

(1) When tubes are being tested, it functions as a free-point filament-return-terminal selector with reference to the circled numbers, positions 1 through 12.
(2) When multirange meter functions are desired this control acts as a *master range selector* providing for all a-c and d-c measurements (except 1200V., 3000V., and 12 AMPS) from the two polarized EXT. TEST pin jacks. This feature is available *only* when control *A* is set to either the AC or the DC position.

g. Line Adjustment Control. This control is a heavy-duty wire-wound potentiometer and serves a double purpose as follows:

(1) When the tube testing features are being used, the control is used to adjust the line voltage to the proper value by bringing the meter pointer to the arrowhead center of the scale marked LINE.

(2) When employing the 0-10 megohms range, the control is used to adjust the ohmmeter range by accurate regulation of the tester power supply.

h. Automatic Push-button System. The system consists of 12 push buttons identified as OFF, *A* (FILAMENT CONTINUITY), *B, C, D, E, F, G, H, J,* READ METER, and TUBE MERIT. These buttons perform the following functions:

(1) OFF BUTTON. The OFF button, when in the down or depressed position, shuts the instrument off, and simultaneously releases any other buttons that have been previously depressed. The TUBE MERIT button, located at the opposite end of the push-button system, turns the instrument on.
(2) LETTERED BUTTONS A, B, C, D, E, F, G, H, AND J. These buttons connect to corresponding prong positions of the sockets, permitting an arrangement whereby any combination of electrodes required may be connected into the appropriate part of the test circuit, regardless of the element pin positions. This lettered set of push buttons operates through the circuit in conjunction with controls A, E, and F, providing a complete free-point tube analysis system. The operation of these lettered buttons serves the following purposes:

(a) Provides a visible (neon lamp) filament continuity test from lettered button *A,* unless otherwise noted on the tube roller chart.

(b) Provides for hot interelement-short check and cathode-leakage tests.

(c) Provides for proper tube circuit selections for quality indications.

(3) READ METER BUTTON. This button, which is in no way *mechanically* interlocked with the rest of the push-button system, merely provides meter reading for tube quality indications.

(4) TUBE MERIT BUTTON. This is a double action button designed to perform two entirely different functions depending upon the applied pressure.

(a) A light pressure releases the OFF button and turns the instrument ON providing immediate LINE indication on the meter when control A is in any of the tube testing positions 1 through 9.

(b) When fully depressed, this button interrupts the LINE indication on the meter and provides a mechanical arrangement that allows any required number of the lettered buttons *A* through *J* to remain in the depressed (locked) position when pressed down.

i. Tube Sockets. This instrument provides individual loktal, octal, combination seven-prong, miniature seven-prong, bantam junior, six-prong, five-prong, and four-prong tube sockets. All tube analysis such as filament continuity, hot cathode leakage, hot neon short check, and tube quality tests, are all obtained from any one of the required sockets without the necessity of shifting the tube under test.

j. Overhead Connector Cap. The bakelite-encased twin grid cap, which is connected to a flexible lead, accommodates the top caps of both octal and non-octal types of tubes. This connector cap is attached to tubes requiring a top-cap connection when tests are made.

k. Meter. The meter used is large, square, and ruggedly constructed, with a base sensitivity of 400 microamperes at 160 millivolts. The movement used is a D'Arsonval type, and the meter has an a-c accuracy of 3 per cent and a d-c accuracy of 2 per cent full scale. The meter incorporates a correction scale for a-c measurements.

l. Noise Test Jacks. These jacks permit the insertion of a headset or amplifier system into the tester circuit in order to obtain audible noise indications from tubes under test.

m. Capacitor Test Jack. This jack, which is the center pin of the bantam junior socket, is used in conjunction with either one of the NOISE TEST jacks to provide a qualitative test on paper and mica capacitors. The neon lamp is used as an indicator. These jacks can also be used for continuity testing with the neon lamp.

n. Neon Lamp Indicator. The neon lamp is located immediately above the NOISE TEST jacks and provides a sensitive visible indication for continuity tests, capacitor tests, and short checks on tubes.

o. Pilot Light Test Socket. This socket is located in the center of the combination seven-prong tube socket on the upper right of the panel. It accommodates all miniature screw- and bayonet-base pilot lamps. When testing lamps, be sure to make proper contact between the base of the lamp and the interior of the socket in order to obtain correct indication.

SECTION IV

MAINTENANCE

NOTE: Failure or unsatisfactory performance of equipment used by Army Ground Forces and Army Service Forces will be reported on W.D., A.G.O. Form No. 468 (Unsatisfactory Equipment Report). If Form No. 468 is not available, see TM 38-250. Failure or unsatisfactory performance of equipment used by Army Air Forces will be reported on Army Air Forces Form No. 54 (Unsatisfactory Report).

17. GENERAL.

a. If the instrument does not turn on when the TUBE MERIT button is lightly depressed, inspect the two 1-ampere fuses incorporated in the fused male plug and replace them, if necessary. It is not necessary to disassemble the plug in order to replace these fuses. Simply insert a pointed object into the two holes (provided for this purpose) on the top of the plug and eject the fuses.

b. If the instrument does not operate properly after being turned on, the rectifier tube may be defective. A defective rectifier is indicated by inability to adjust the line voltage properly. To gain access to the interior of the instrument proceed as follows:

(1) Remove the 12 mounting screws from the edges of the panel.

(2) Carefully raise the lower edge and reverse the panel by turning it up and over. The leads to the ohmmeter battery are just long enough to permit this operation. The rectifier tube can now be removed from its socket (fig. 3).

c. Replace burned-out pilot lamps and defective neon lamps by removing the panel and installing new lamps as required.

d. If difficulty is experienced when testing tubes that use the overhead connector cap, check for continuity between the flexible lead and the bakelite-encased twin grid cap. The flexible lead occasionally breaks at the point of entrance to the connector cap.

e. Replace the ohmmeter battery if full-scale deflection cannot be obtained when zero-adjusting the three lesser ohmmeter ranges. The battery is mounted on the inside of the cabinet as shown in figure 3. To install a new battery proceed as follows:

(1) Remove the panel as described in subparagraph **b** above.

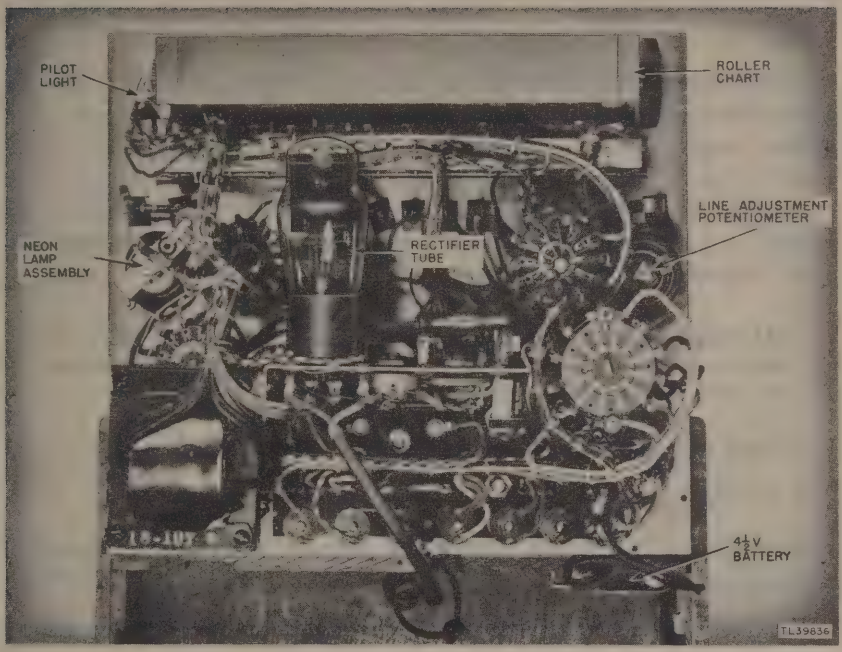


Figure 3. Instrument panel, under side.

(2) Loosen the bracket that mounts the battery and remove the battery from the cabinet.

(3) Disconnect the two battery leads, being careful to observe the polarity of the battery and the connection of each lead.

(4) Connect the two leads to the proper terminals of the new battery.

(5) Install the new battery in the cabinet and mount it securely by tightening the mounting bracket.

18. MOISTUREPROOFING AND FUNGIPROOFING.

a. General. The operation of Signal Corps equipment in tropical areas where temperature and relative humidity are extremely high requires special attention. The following items represent problems which may be encountered in operation:

(1) Resistors, capacitors, coils, chokes, transformer windings, etc., fail.

(2) Electrolytic action takes place in resistors, coils, chokes, transformer windings, etc., causing eventual break down.

(3) Hook-up wire and cable insulation breaks down. Fungus growth accelerates deterioration.

(4) Moisture forms electrical leakage paths on terminal strips causing flashovers.

b. Treatment. A moistureproofing and fungiproofiing treatment has been devised which, if properly applied, provides a reasonable degree of protection against fungus growth, insects, corrosion, salt spray, and moisture. The treatment involves the use of a moisture- and fungi-resistant varnish applied with a spray gun or brush. Refer to TB SIG 13, Moistureproofing and Fungiproofing Signal Corps Equipment, for a detailed description of the varnish-spray method of moistureproofing and fungiproofing.

CAUTION: Varnish spray may have toxic effects if inhaled. To avoid inhaling spray use respirator, if available; otherwise, fasten cheesecloth or other cloth material over the nose and mouth.

c. Step-by-step Instructions for Treating Test Set I-157-A.

(1) PREPARATION.

(a) Make all repairs and adjustments necessary for proper operation of the equipment.

(b) Clean all dirt, dust, rust, fungus, oil, grease, etc., from the equipment to be processed.

(2) DISASSEMBLY.

(a) Open the hasps on the cover of the wooden case and remove the cover.

(b) Remove the 12 screws from the outside edges of the instrument panel.

(c) Lift the chassis out of the case as far as the wiring will permit.

(d) Replace the 12 panel mounting screws in the case.

(e) Disconnect the two leads from the 4.5-volt ohmmeter battery which is mounted inside the case (fig. 3).

(f) Loosen the nut on the battery mounting bracket.

(g) Remove the battery from the case and retighten the nut on the mounting bracket.

(h) Remove the test leads and the power cable from the storage section of the case.

(3) MASKING.

No masking is required.

(4) DRYING.

Dry the equipment for 6 hours at 140° F.

(5) VARNISHING.

(a) Apply three coats of Lacquer, Fungus-resistant, Spec. No. 71-2202 (Stock No. 6G1005.3) or equal.

(b) Brush-coat on the under side of the chassis, all phenolic parts and fabric-covered wiring, fixed resistors and capacitors, and the transformer winding.

CAUTION: Do not coat the gears or any electrical contacts.

(c) Spray the inside of the wooden case.

(6) REASSEMBLY.

Reassemble the set and test its operation.

(7) MARKING.

Mark the set with "MFP" and the date of treatment. Example: MFP—4 Oct. 1944.

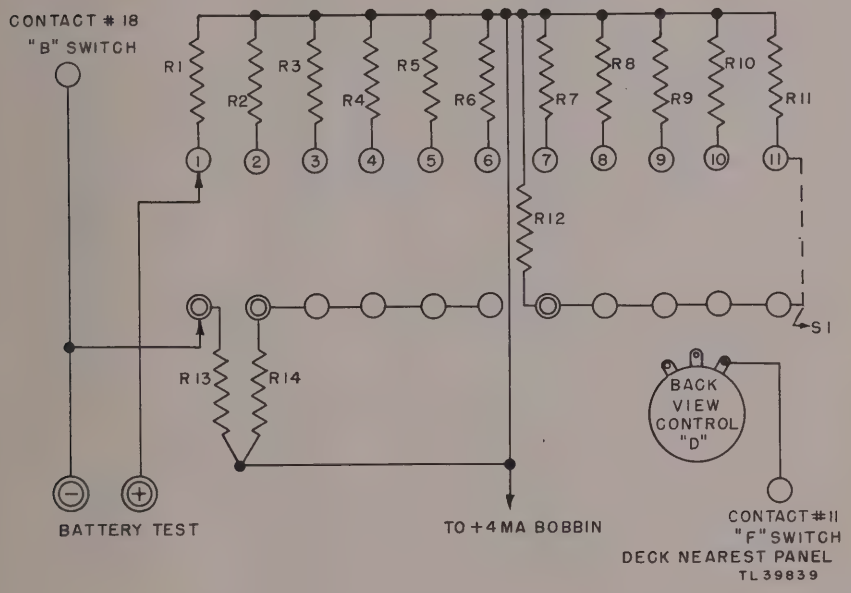
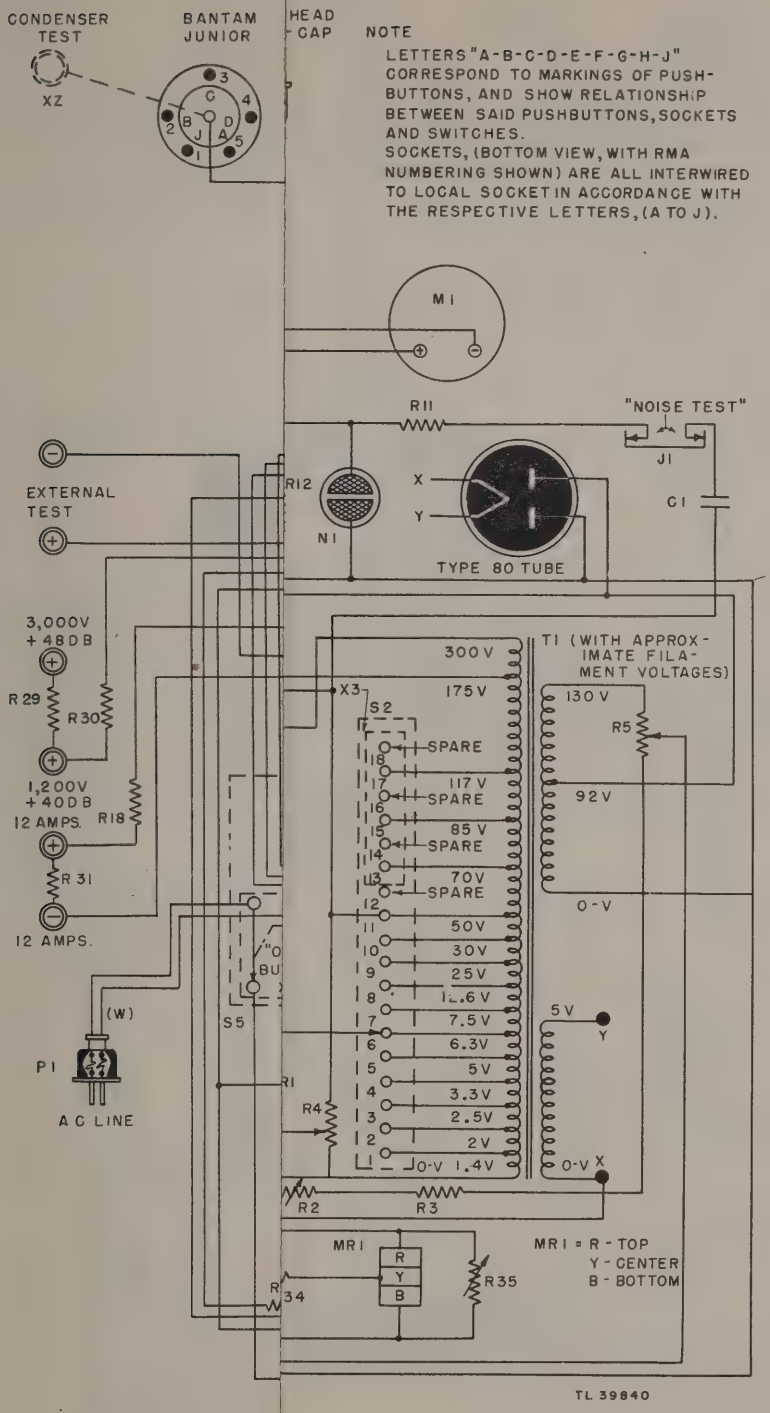


Figure 4. Battery testing circuit, schematic diagram.


CONDENSER TEST
XZ
BANTAM JUNIOR
HEAD CAP
NOTE
LETTERS "A-B-C-D-E-F-G-H-J" CORRESPOND TO MARKINGS OF PUSH-BUTTONS, AND SHOW RELATIONSHIP BETWEEN SAID PUSHBUTTONS, SOCKETS AND SWITCHES.
SOCKETS, (BOTTOM VIEW, WITH RMA NUMBERING SHOWN) ARE ALL INTERWIRED TO LOCAL SOCKET IN ACCORDANCE WITH THE RESPECTIVE LETTERS, (A TO J).
M1
R11
"NOISE TEST"
J1
C1
EXTERNAL TEST
R12
N1
X
Y
TYPE 80 TUBE
3,000V +48DB
R29
R30
1,200V +40DB
12 AMPS.
R18
R31
12 AMPS.
T1 (WITH APPROXIMATE FILAMENT VOLTAGES)
300V
175V
X3
S2
SPARE
117V
SPARE
85V
SPARE
70V
SPARE
50V
30V
25V
7.5V
6.3V
5V
3.3V
2.5V
2V
0-V 1.4V
130V
R5
92V
0-V
5V
Y
0-V X
(W)
P1
AC LINE
S5
R1
R4
R2
R3
MR1
R
Y
B
R35
R34
MR1 = R - TOP
Y - CENTER
B - BOTTOM
TL 39840

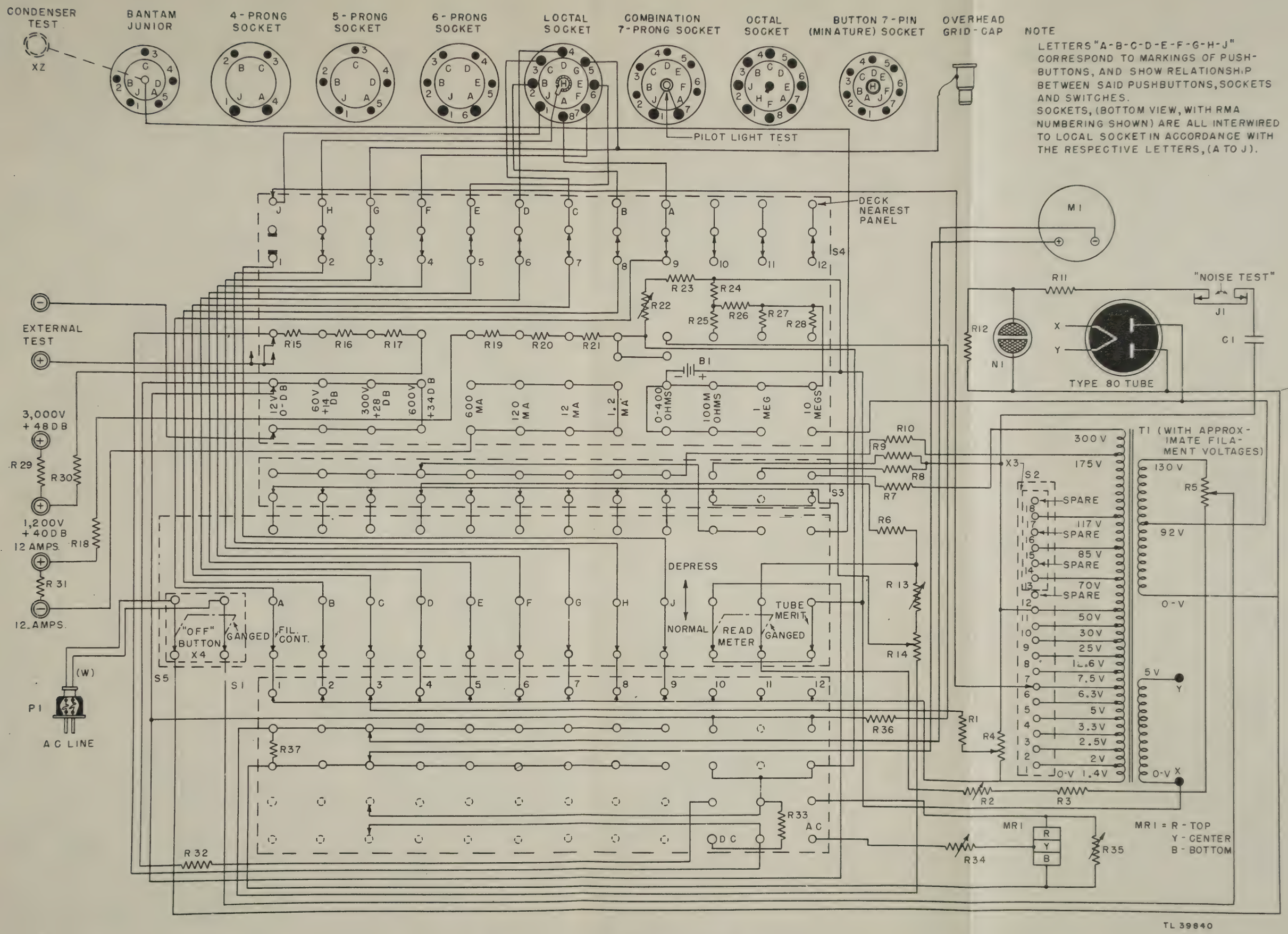
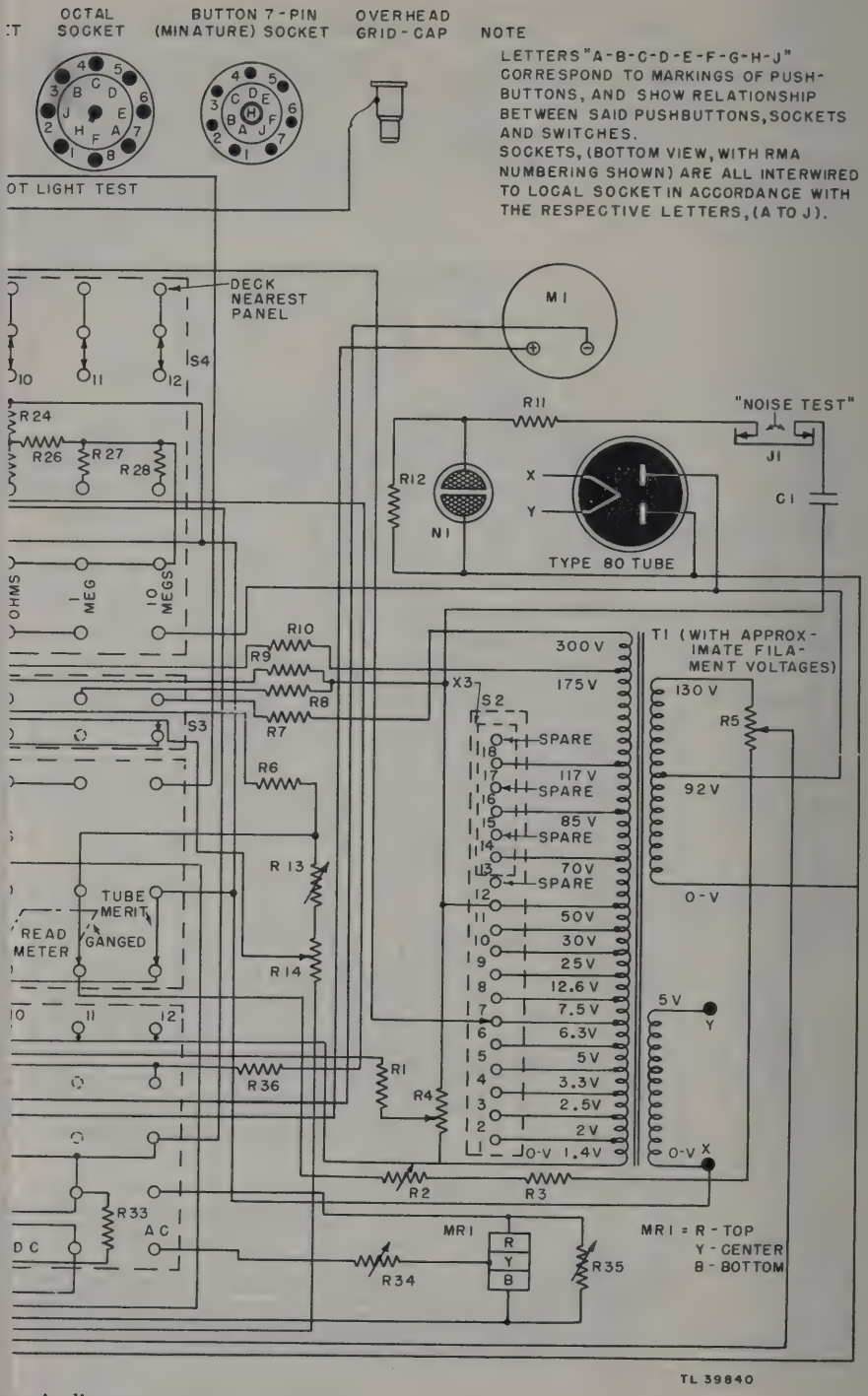


Figure 5. Tube and set tester, schematic diagram.



natic diagram.

SECTION V

SUPPLEMENTARY DATA

19. MAINTENANCE PARTS LIST FOR TEST SET I-157-A.

Reference symbol	Signal Corps stock No.	Major comp	Name of part and description	Quan per unit	Orgn stock		3d ech	4th ech	Depot stock
					1st ech	2d ech			
1016-C1	3DA100-242		CAPACITOR: fixed; paper; tubular; 100,000 mmf ±20%; 400 vdcw; ½″ diam x 1½″ lg; #20 axial wire leads 1½″ lg; solar type #S-0238 (std commercial).	1					*
	2Z5581-5		CONNECTOR: female cont; bakelite; Eby type #52; black.	10					*
1016-P1	6Z7574-3		PLUG: double fused line; non-polarized; block attachtachment plug less fuses; requires 2 type #3AG 1-amp, 250 v fuses; Electro-Motive Mfg Co type #500.	1					*
1016-N1	2Z5890-13		LAMP: glow; 115 v, 1 w; candelabra base; GE type.	1	3				*
	2Z5925		LAMP: incandescent; LM-25; 6-8 v; 150 ma; std mazda #40.	1	5				*
	2Z5882-40		LAMP holder: incandescent; Sig Ind Co part #555-S; w/red jewel.	1	2				*
1016-M1	3F4157A.1		METER: microammeter; dc; 0-400 ma; black bakelite; moulded case; self contained; sect flush mtg; flange 4⅝″ x 4¼″; body 2¾″ x 1″; Simpson Elec Co.	1					*

* Indicates stock available

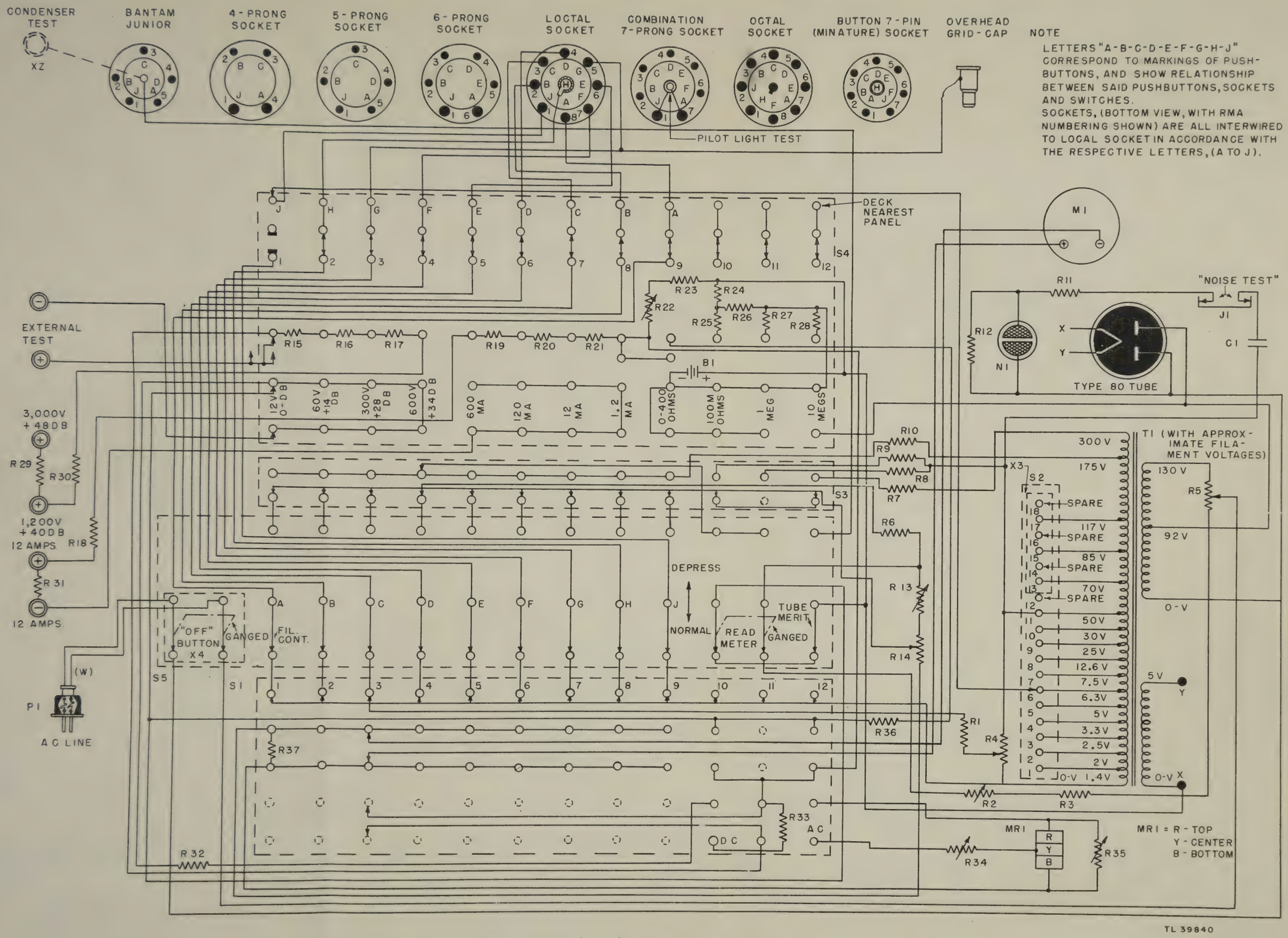


Figure 5. Tube and set tester, schematic diagram.

SECTION V

SUPPLEMENTARY DATA

19. MAINTENANCE PARTS LIST FOR TEST SET I-157-A.

Reference symbol	Signal Corps stock No.	Major comp	Name of part and description	Quan per unit	Orgn stock		3d ech	4th ech	Depot stock
					1st ech	2d ech			
1016-C1	3DA100-242		CAPACITOR: fixed; paper; tubular; 100,000 mmf ±20%; 400 vdcw; ½″ diam x 1½″ lg; #20 axial wire leads 1½″ lg; solar type #S-0238 (std commercial).	1					*
	2Z5581-5		CONNECTOR: female cont; bakelite; Eby type #52; black.	10					*
1016-P1	6Z7574-3		PLUG: double fused line; non-polarized; block attachtachment plug less fuses; requires 2 type #3AG 1-amp, 250 v fuses; Electro-Motive Mfg Co type #500.	1					*
1016-N1	2Z5890-13		LAMP: glow; 115 v, 1 w; candelabra base; GE type.	1	3				*
	2Z5925		LAMP: incandescent; LM-25; 6-8 v; 150 ma; std mazda #40.	1	5				*
	2Z5882-40		LAMP holder: incandescent; Sig Ind Co part #555-S; w/red jewel.	1	2				*
1016-M1	3F4157A.1		METER: microammeter; dc; 0-400 ma; black bakelite; moulded case; self contained; sect flush mtg; flange 4⅝″ x 4¼″; body 2¾″ x 1″; Simpson Elec Co.	1					*

* Indicates stock available

19. MAINTENANCE PARTS LIST FOR TEST SET I-157-A (cont'd).

Reference symbol	Signal Corps stock No.	Major comp	Name of part and description	Quan per unit	Organ stock		3d ech	4th ech	Depot stock
					1st ech	2nd ech			
1016-S1	3Z9825-62.138		SWITCH: rotary; special contacting; 11 positions; 3 decks; bakelite insulation; body 1 7/8" diam x 1 3/8" d; Oak part #18366-QH3; (0.248" x 3/8" lg shaft; 3/8"-32 x 3/8" bushing selector switch "A" and AC-DC).	1					*
1016-S2	3Z9825-33.18		SWITCH: rotary; 1 pole, 18 positions; 1 deck; bakelite insulation; body 1 3/4" diam x 3/4" d; Mallory part #B-112923-Sub-3; (0.248" x 3/8" lg shaft; 3/8"-32 x 3/8" bushing; filament voltage selector switch "B").	1					*
1016-S3	3Z9825-62.139		SWITCH: rotary; special contacting; 12 positions; 3 decks; bakelite insulation; body 1 7/8" diam x 2 3/4" d; Oak part #21129-QH3; (0.248" x 3/8" lg shaft; 3/8"-32 x 3/8" bushing; selector switch "E").	1					*
1016-S4	3Z9825-33.10		SWITCH: rotary; special contacting; 12 positions; 7 decks; bakelite insulation; body 2 3/8" diam x 3 1/2" d; Mallory part #B-112754-SUB-1; (0.248" x 3/8" lg shaft; 3/8"-32 x 3/8" bushing filament position selector switch "F" and range selector switch for multi-range test).	1					*
1016-S5	3Z9824-261.7		SWITCH: push button; special contacting; 12 sect; bakelite insulation; Oak part #18153-80 AC; (9 7/8" mtg centers; mts w/two #6-32 RHMS; 3/4 centers between sect; body 2 1/8" d; behind panel).	1					*

* Indicates stock available

19. MAINTENANCE PARTS LIST FOR TEST SET I-157-A (cont'd).

Reference symbol	Signal Corps stock No.	Major comp	Name of part and description	Quan per unit	Organ stock		3d ech	4th ech	Depot stock
					1st ech	2nd ech			
1016-R13	2Z7277.84		RESISTOR: variable; wire wound; 40 ohms −0 +20%; Clarostat type MH; (body 1⅛″ diam + ¼″ d; bushing ⅜″ −32; flush screw driver shaft); (potentiometer).	1					*
1016-R14	2Z7278.2		RESISTOR: variable; wire wound; special taper; 300 ohms ±5%; 3 w; Clarostat; special for Precision Appar type #P-58; (prec #17-104A) (body 1⅝″ diam x ¾″ d; bushing ⅜″ −32 x ⅜″; shaft 0.248″ x ⅜″ shaft; insulated cont arm); (potentiometer).	1					*
1016-R5	3Z7230-4		RESISTOR: variable; wire wound; 300 ohms ±10%; 25 w; Clarostat type #PW-25 (prec #17-107A) (body 1⅝″ diam x 1″ d; bushing ⅜″-32 x ⅜″; shaft 0.248″ x ⅜″ lg; insulated cont arm); (potentiometer).	1					*
1016-R4	2Z7284.79		RESISTOR: variable; wire wound; linear; dual m; R4 is 1,000 ohms ±5%; 3 w; R22 is 550 ohms −0 +20%; 3 w; Clarostat type #DP-58; (prec #17-112A) (body 1⅝″ diam x 2″ overall tandem d; bushing ⅜″ −32 x ⅜″; shaft 0.248″ x ⅜″ lg; insulated cont arm); (potentiometer).	1					*
1016-R2 1016-R34 1016-R35	2Z7281.109		RESISTOR: variable; wire wound; linear; 12,000 ohms −0 +20%; 1 w; Wirt Co #801 (body 1⅛″ diam x ½″ d; ⅜″ −32 x ¼″ bushing; 0.248″ flush screwdriver shaft; noninsulated cont arm); (potentiometer).	3					*

* Indicates stock available

19. MAINTENANCE PARTS LIST FOR TEST SET I-157-A (cont'd).

Reference symbol	Signal Corps stock No.	Major comp	Name of part and description	Quan per unit	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
1016-R31	3F3802-12		RESISTOR: fixed; copper alloy strip; 0.02 ohms ±1%; 10 w; Prec Appar type #920-12A; (3¼″ lg x ¼″ wd x 0.0113″ thk).	1					*
1016-R18	3Z5983-14		RESISTOR: fixed; wire wound; wood spool; 0.38 ohms ±1%; 600 ma; Prec Appar type #B-2; (11/16″ diam x ⅞″ lg).	1					*
1016-R19	3Z5991-60		RESISTOR: fixed; wire wound; wood spool; 1.6 ohms ±1%; 120 ma; Prec Appar type #B-2; (11/16″ diam x ⅞″ lg).	1					*
BT-R13 BT-R14	3Z5992C3		RESISTOR: fixed; wire wound; wood spool; 2 resistors wound on one spool; R13-0.555 ohms ±1%; 200 ma; R14-2.31 ohms ±1%; 50 ma; Prec Appar type #B-2; (3 term; 11/16″ diam x ⅞″ lg).	1					*
BT-R1	3Z5997-8		RESISTOR: fixed; wire wound; bakelite; 7 ohms ±5%; ½ w; IRC type #BW-½; (3/16″ diam x ⅝″ lg); Prec Appar part 15-550.	1					*
BT-R12	3Z6001E5-44		RESISTOR: fixed; wire wound; bakelite; 15.07 ohms ±5%; ½ w; IRC type #BW-½; (3/16″ diam x ⅝″ lg); Prec Appar part 15-551.	1					*
1016-R20	3Z6001F6-14		RESISTOR: fixed; wire wound; wood spool; 18.0 ohms ±1%; 12 ma; Prec Appar type #B-2; (11/16″ diam x ⅞″ lg).	1					*

* Indicates stock available

19. MAINTENANCE PARTS LIST FOR TEST SET I-157-A (cont'd).

Reference symbol	Signal Corps stock No.	Major comp	Name of part and description	Quan per unit	Organ stock		3d ech	4th ech	Depot stock
					1st ech	2nd ech			
1016-R36	3Z6002A1-8		RESISTOR: fixed; wire wound; wood spool; 20 to 23 ohms ±1%; 600 ma; Prec Appar type #B-2; (1 1/16" diam x 7/8" lg).	1					*
1016-R37	3Z6004D4-1		RESISTOR: fixed; wire wound; wood spool; 44.4 ohms ±1%; 4 ma; Prec Appar type #B-2; (1 1/16" diam x 7/8" lg).	1					*
BT-R2	3Z6005H8		RESISTOR: fixed; wire wound; bakelite; 58 ohms ±5%; ½ w; IRC type #BW-½; (3/16" diam x 5/8" lg); Prec Appar part 15-552.	1					*
BT-R3	3Z6008H8-2		RESISTOR: fixed; wire wound; bakelite; 88 ohms ±5%; ½ w; IRC type #BW-½; (3/16" diam x 5/8" lg); Prec Appar part 15-553.	1					*
BT-R4	3Z6011H8		RESISTOR: fixed; wire wound; bakelite; 118 ohms ±5%; ½ w; IRC type #BW-½; (3/16" diam x 5/8" lg); Prec Appar part 15-554.	1					*
BT-R5	3Z6014H8		RESISTOR: fixed; wire wound; bakelite; 148 ohms ±5%; ½ w; IRC type #BW-½; (3/16" diam x 5/8" lg); Prec Appar part 15-560.	1					*
BT-R6	3Z6017H8		RESISTOR: fixed; wire wound; bakelite; 178 ohms ±5%; ½ w; IRC type #BW-½; (3/16" diam x 5/8" lg); Prec Appar part 15-555.	1					*

* Indicates stock available

19. MAINTENANCE PARTS LIST FOR TEST SET I-157-A (cont'd).

Reference symbol	Signal Corps stock No.	Major comp	Name of part and description	Quan per unit	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depo stock
R21	3Z6018-19		RESISTOR: fixed; wire wound; wood spool; 180 ohms ±1%; 1.2 ma; Prec Appar type #B-2; (11/16" diam x 7/8" lg).	1					*
1016-R32	3Z6026F6		RESISTOR: fixed; wire wound; wood spool; 260 ohms to 270 ohms ±1%; 0.6 amps; Prec Appar type; (11/16" diam x 7/8" lg) B-2.	1					*
1016-R24	3Z6028H8		RESISTOR: fixed; wire wound; ceramic; 288 ohms ±1%; 1 w; Prec resistor type #PW-1; (3/16" diam x 1" lg); Prec Appar 15-101.	1					*
1016-R8	3Z6029E5-1		RESISTOR: fixed; wire wound; cement coated; 295 ohms ±3%; 7w; Clarostat type #BC7YG; (flat construction; 1 3/4" lg x 7/16" wd x 3/32" thk; Prec Appar 15-537.	1					*
1016-R1 R23	3Z6050-67		RESISTOR: fixed; wire wound; bakelite; 500 ohms ±5%; 1/2 w; IRC type #BW-1/2; (3/16" diam x 5/8" lg) Prec Appar type 15-502.	2					*
1016-R25	3Z6053A1		RESISTOR: fixed; wire wound; ceramic; 531 ohms ±1%; 1 w; Prec resistor type #PW-1; (3/16" diam x 1" lg); Prec Appar type 15-103.	1					*
1016-R10	3Z6200-146		RESISTOR: fixed; wire wound; cement coated; 2,000 ohms ±3%; 7 w; Clarostat type #BC7YG; (flat construction; 1 3/4" lg x 7/16" wd x 3/32" thk); Prec Appar type 15-531A.	1					*

* Indicates stock available

19. MAINTENANCE PARTS LIST FOR TEST SET I-157-A (cont'd).

Reference symbol	Signal Corps stock No.	Major comp	Name of part and description	Quan per unit	Organ stock		3d ech	4th ech	Depot stock
					1st ech	2nd ech			
BT-R7	3RC21BE222J		RESISTOR: fixed; composition; bakelite; 2,250 ohms ±5%; ½ w; IRC type #BT-½; (3/16" diam x 5/8" lg); Prec Appar type 15-556.	1					*
1016-R26	3Z6259B2		RESISTOR: fixed; wire wound; ceramic; 2,592 ohms ±1%; 1 w; Prec resistor type #PW-1; (3/16" diam x 1" lg); Prec Appar type 15-104.	1					*
BT-R8	3Z6450-20		RESISTOR: fixed; composition; bakelite; 4,500 ohms ±5%; ½ w; IRC type #BT-½; (3/16" diam x 5/8" lg); Prec Appar type 15-557.	1					*
1016-R9	3Z6500-10		RESISTOR: fixed; composition; bakelite; 5,000 ohms ±5%; ½ w; IRC type #BT-½; (3/16" diam x 5/8" lg); Prec Appar part 15-507.	1					*
BT-R9	3Z657E5-1		RESISTOR: fixed; composition; bakelite; 6,750 ohms ±5%; ½ w; IRC type #BT-½; (3/16" diam x 5/8" lg); Prec Appar part 15-558.	1					*
1016-R27	3Z6572B2		RESISTOR: fixed; wire wound; ceramic; 7,202 ohms ±1%; 1 w; Prec resistor type #PW-1; (3/16" diam x 1" lg); Prec Appar part 15-111.	1					*
BT-R10	3Z6590-18		RESISTOR: fixed; composition; bakelite; 9,000 ohms ±5%; ½ w; IRC type #BT-½; (3/16" diam x 5/8" lg); Prec Appar part 15-541.	1					*

* Indicates stock available

19. MAINTENANCE PARTS LIST FOR TEST SET I-157-A (cont'd).

Reference symbol	Signal Corps stock No.	Major comp	Name of part and description	Quan per unit	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
1016-R33	3Z6960-19.59		RESISTOR: fixed; composition; bakelite; 2 sections; 2 — 5,920 ohms ea section; type #BT-½; series matched to 11,840 ohms ±1%; ½ w; IRC type #BT-½; (3/16" diam x 5/8" lg ea section); Prec Appar part 15-150.	1					*
BT-R11	3Z6613A5-1		RESISTOR: fixed; composition; bakelite; 13,500 ohms ±5%; ½ w; IRC type #BT-½; (3/16" diam x 5/8" lg).	1					*
1016-R3	3RC21BE153M		RESISTOR: fixed composition; bakelite; 15,000 ohms ±20%; ½ w; IRC type #BT-½.	1					*
1016-R7	3Z6630-12		RESISTOR: fixed; wire wound; cement or vitreous coated; 30,000 ohms ±5%; 10 w; Clarostat type #A-10-F.	1					*
1016-R11	3Z6635-1		RESISTOR: fixed; composition; bakelite; 35,000 ohms ±5%; ½ w; IRC type #BT-½.	2					*
1016-R6	3Z6640-1		RESISTOR: fixed; composition; bakelite; 40,000 ohms ±5%; 1 w; IRC type #BT-1.	1					*
1016-R15	3Z6960-20.2		RESISTOR: fixed; composition; bakelite; 2 sections; 2-24,000 ohms ea section; type #BT-½; series matched to 48,000 ohms ±1%; ½ w; IRC type #BT-½.	1					*

* Indicates stock available

19. MAINTENANCE PARTS LIST FOR TEST SET I-157-A (cont'd).

Reference symbol	Signal Corps stock No.	Major comp	Name of part and description	Quan per unit	Organ stock		3d ech	4th ech	Depot stock
					1st ech	2nd ech			
1016-R28	3Z6960-19.58		RESISTOR: fixed; composition; bakelite; 2 sections; 38,000-38,000 ohms; type #BT-½; series matched to 76,000 ohms ±1%; ½ w; IRC type #BT-½ 15-119.	1					*
1016-R16	3Z6960-20.4		RESISTOR: fixed; composition; bakelite; 2 sections; 120,000—120,000 ohms; type #BT-½; series matched to 240,000 ohms ±1%; ½ w; IRC type #BT-½.	1					*
1016-R17	3Z6960-20.5		RESISTOR: fixed; composition; bakelite; 2 sections; 150,000—150,000 ohms; type #BT-½; series matched to 300,000 ohms ±1%; ½ w; IRC type #BT-½.	1					*
1016-R30	3Z6960-20.3		RESISTOR: fixed; composition; bakelite; 2 sections; 300,000-300,000 ohms; type #BT-½; series matched to 600,000 ohms ±1%; ½ w; IRC type #BT-½.	1					*
1016-R12	3Z6750-20		RESISTOR: fixed; composition; bakelite; ½ meg ±20%; ½ w; IRC type #BT-½.	1					*
1016-R29	3Z6960-19.57		RESISTOR: fixed; composition; bakelite; 2 sections; 0.9—0.9 meg; type #BT-1; series matched to 1.8 meg ±1%; 1 w; IRC type #BT-1.	1					*
	2Z8674.8		SOCKET: 4 prong; amphenol type #S4 (for 0.050 chassis).	2					*
	2Z8687		SOCKET: 5 prong; amphenol type #S5 (for 0.050 chassis).	1					*

* Indicates stock available

19. MAINTENANCE PARTS LIST FOR TEST SET I-157-A (cont'd).

Reference symbol	Signal Corps stock No.	Major comp	Name of part and description	Quan per unit	Orgn stock 1st ech	Orgn stock 2d ech	3d ech	4th ech	Depot stock
	2Z8688		SOCKET: 6 prong; amphenol type #S6 (for 0.050 chassis).	1					*
	2Z8677.6		SOCKET: 7 prong; amphenol type #78-7CD (for 0.050 chassis).	1					*
	2Z8799-137		SOCKET: 8 prong; amphenol type #S8 (for 0.050 chassis).	1					*
	2Z8678.21		SOCKET: 8 prong; locktal; amphenol type #78-8L (for 0.050 chassis).	1					*
	2Z8676.2		SOCKET: miniature; 5 prong; amphenol type #78-6H (phantom junior; for 0.050 chassis).	1					*
	2Z8677.5		SOCKET: button; 7 pin; amphenol type #78-7P (for 0.050 chassis).	1					*
	2Z5884-63		LAMP holder: neon; Sig Ind; special for precision; Prec part #10-117.	1					*
1016-T1	2Z9613.331		TRANSFORMER; Gen trans; special for Prec #9M-887; (Prec #18-107B); (pri #92-132V).	1					*
1016-B1	3A31		†BATTERY: 4½ v; Everready type #781 or Burgess type #5360.	1					*
	2Z5848		KNOB: bar; Kurz-Kasch type #S-292-1L; black.	6					*

* Indicates stock available

† Since dry batteries have a limited shelf life, issue and resupply of dry batteries must be arranged for the shortest possible periods to insure that batteries issued to the troops will not be unreasonably exhausted.

19. MAINTENANCE PARTS LIST FOR TEST SET I-157-A (cont'd).

Reference symbol	Signal Corps stock No.	Major comp	Name of part and description	Quan per unit	Organ stock		3d ech	4th ech	Depot stock
					1st ech	2nd ech			
	2Z1480.18		BUTTON: push; Kurz-Kasch type #S330-30; black; Prec Appar part #10-135.	12					*
	2Z5821-33		KNOB: line control; Harry Davies Moulding Co. type #1700; black; Prec Appar part #10-120.	1					*
	2J80		RECTIFIER: electron tube; std type #80.	1	*				*
1016-MR1	3F3778-2		RECTIFIER UNIT: 10 ma rating; body $\frac{5}{8}$" x $\frac{1}{2}$" diam; Schauer Mach type #5049-B2 (#6-32 x $\frac{7}{8}$" FHMS concentric mtg; 3 term $3\frac{1}{2}$" lg; #22 flexible wire leads).	1					*

* Indicates stock available

Order No. 473-MPD-43 772 Copies 20 November 1944

INSTRUCTIONS FOR OPERATING THE PRECISION SERIES 844 MULTI-RANGE TESTER

In the design of the Series 844 rotary selective multi-range tester, Precision engineers have embodied advanced circuit features, making available all A.C. and D.C. voltages (except 1200 volts and 6000 volts), resistance, output indications, decibel and D.C. current measurements (except 1200 MA and 12 AMPS.), at only one set of polarized tip jacks through the use of a master MULTI-RANGE SELECTOR.

This rotary RANGE SELECTOR permits speedy range change without the necessity of removing and re-inserting test leads, as would be required if numerous tip jacks were employed.

As a precaution against meter overloads, four polarized tip jacks provide for two distinct D.C. current ranges; namely, 1200 MA and 12 AMPS. Two highly insulated tip jacks provide for obtaining high voltage measurements (above 600 to 6000 volts). These ranges are used in conjunction with the RANGE SELECTOR as is outlined in "Operating Instructions".

The Series 844 tester provides the following:

1. SIX A.C. VOLTAGE RANGES at 1000 ohms per volt:
   0-12; 0-60; 0-300; 0-600; 0-1200; 0-6000 volts.
2. SIX D.C. VOLTAGE RANGES at 1000 ohms per volt:
   0-12; 0-60; 0-300; 0-600; 0-1200; 0-6000 volts.
3. SIX D.C. CURRENT RANGES:
   0-1.2; 0-12; 0-60; 0-300; 0-1200 MA; and 0-12 AMPERES.
4. FOUR RESISTANCE RANGES:
   0-400 ohms (20 ohms center) SHUNT METHOD
   0-100,000 ohms (800 ohms center)
   0-1 Megohm (8,000 ohms center)
   0-10 Megohms (80,000 ohms center)
5. SIX DECIBEL RANGES FROM -12 to +70 DB.
6. SIX OUTPUT RANGES:
   0-12; 0-60; 0-300; 0-600; 0-1200; 0-6000 volts.
7. D.C. CURRENT MEASUREMENTS OF LEAKAGE IN ELECTROLYTIC CONDENSERS.
8. QUALITATIVE PAPER CONDENSER TESTS.

OPERATING INSTRUCTIONS

Before attempting to operate the instrument, particular note must be taken of the fact that there are two distinct sets of tip jacks incorporated in the lower left and right corners of the instrument panel.

The right hand set of tip jacks marked "TEST" are used for all resistance, decibel, output indications and current measurements except 1200 MA and 12 AMPS. and for voltage measurements only up to 600 volts.

The left hand set of extra high voltage tip jacks marked +1200V and +6000V are employed for voltage measurements above 600 to 6000 volts. The minus (-) "TEST" tip jack is used as the common minus (-) tip jack for either the +1200V or +6000V ranges.

THE ROTARY RANGE SELECTOR SHOULD ALWAYS FIRST BE SET TO THE 600V POSITION WHEN USING EITHER OF THE TWO EXTRA HIGH VOLTAGE RANGES.

CAUTION: When employing the 1200v. and 6000v. ranges, for measurements in extra high voltage circuits, extreme care must be observed in the manner of handling test prods, tip jacks and high voltage circuits under analysis. We recommend, for this purpose, only the use of "PRECISION" extra-high voltage super-flex test leads, (Part #228) which have been specifically designed for full safety of operation up to 6000 volts D.C. and 60 cycles A.C.

A.C. VOLTAGE MEASUREMENTS.

Set "AC-DC" switch to the A.C. position for all A.C. voltage measurements. Select suitable voltage range on the RANGE SELECTOR. Read A.C. voltage measurements on RED A.C. CORRECTION SCALE as follows:

0-12 volts read directly
0-60 volts read directly
0-300 volts read directly
0-600 volts read on 60 scale, multiply by 10
0-1200 volts read on 12 scale, multiply by 100
0-6000 volts read on 60 scale, multiply by 100

D.C. VOLTAGE MEASUREMENTS.

Set "AC-DC" switch to the D.C. position for all D.C. voltage measurements. Select suitable voltage range on the RANGE SELECTOR. Read D.C. voltage measurements on D.C. meter scale as follows:

0-12 volts read directly
0-60 volts read directly
0-300 volts read directly
0-600 volts read on 60 scale, multiply by 10
0-1200 volts read on 12 scale, multiply by 100
0-6000 volts read on 60 scale, multiply by 100

All voltage measurements are made with test leads applied across load. Observe proper polarity at tip jacks.

IMPORTANT PRECAUTIONS
When Testing High Voltage Circuits

Whenever making voltage measurements in any circuits wherein the potentials exceed 3000 volts, it is advisable for the operator to connect the instrument panel to a good ground. The cold water pipe is usually sufficient. Connection should be made from ground source to under one of the etched instrument panel border mounting screws.

This practice will protect the operator at all times from electrostatic charges which may readily accumulate on instrument panel, or in the case of metal cased units, on both case and panel.

* * * * *

BEFORE making ANY MEASUREMENTS in a Television Receiver or in any other device wherein the POSITIVE (+) side of the high voltage power supply is connected to chassis, it is absolutely IMPERATIVE that all external ground connections be removed. This includes the following:

1. DISCONNECT ANY external grounding leads (such as from radiators, cold water pipes or power line neutrals) which may be connected (directly or through a condenser) to the receiver or device upon which measurements are to be made.

2. COMPLETELY DISCONNECT ALL power line by-pass condensers from their connection to the A.C. line cord or power transformer primaries.

* * * * *

NEVER attempt adjustment or test of any circuits (such as television receivers) wherein exceedingly dangerously high voltages are present unless a complete circuit diagram is available to identify the location of all high potential terminals. Always employ well insulated test leads, such as the Precision Extra High Voltage Super-Flex test leads, Part #228. Available from distributor.

* * * * *

Make sure hands and shoes are DRY when performing tests wherein high voltages are involved.

* * * * *

D.C. CURRENT MEASUREMENTS.

It is important to note that the 1200 MA and 12 AMPERE ranges are only obtainable through the use of their respective sets of tip jacks located on instrument panel, when RANGE SELECTOR IS SET TO THE 300 MA POSITION.

Set "AC-DC" switch to the D.C. position for all D.C. current measurements. Select proper current range on the RANGE SELECTOR. Read D.C. current measurements on D.C. meter scale as follows:

0-1.2 MA read on 12 scale, divide by 10
0-12 MA read directly
0-60 MA read directly
0-300 MA read directly
0-1200 MA read on 12 scale, multiply by 100
0-12 AMPS read directly

NOTE: When using the 12 AMPERE D.C. range, never remove pin jacks while current is flowing through the circuit. Failure to observe this would result in arcing at the pin jacks being removed, and though it would not injure the meter, the jack would gradually char.

All current measurements are made with test leads in series with load. Observe proper polarity at tip jacks.

CAUTION: When voltage or current of unknown value is to be measured, it is advisable to employ the highest range first. If meter indication is slight, then select next lower range, etc. Adhere closely to the above in order to prevent slamming of meter pointer and meter overloading.

RESISTANCE MEASUREMENTS.

Set "AC-DC" switch to the D.C. position for all resistance measurements.

0-400 OHMS (Low Ohms) RANGE

The LOW OHMS circuit makes use of the SHUNT METHOD (back-up scale) for low resistance measurements, thereby producing an immediate meter pointer deflection when RANGE SELECTOR is set to the LOW OHMS position. With "TEST" tip jacks open (NOT SHORTED), rotate ADJUST OHMS control to bring needle pointer to full scale (LO) deflection before applying open test leads across resistance to be measured.

Resistance measurements for this low range are read directly on the LOWER PORTION of the OHMS SCALE. Indications for this range start from the left.

MEDIUM, HIGH AND EXTRA HIGH OHMMETER RANGES:

Ohmmeter adjustments for these three resistance ranges are as follows: Set RANGE SELECTOR to the desired ohmmeter range and with "TEST" leads SHORTED, rotate "ADJUST OHMS" control to obtain full scale deflection. Then proceed with measurements.

Resistance measurements for these three ranges are read on the upper (0-100M) ohms scale as follows:

0-100M ohms range read directly on 0-100M scale
0-1 Megohm range multiply reading obtained by 10
0-10 Megohm range multiply reading obtained by 100

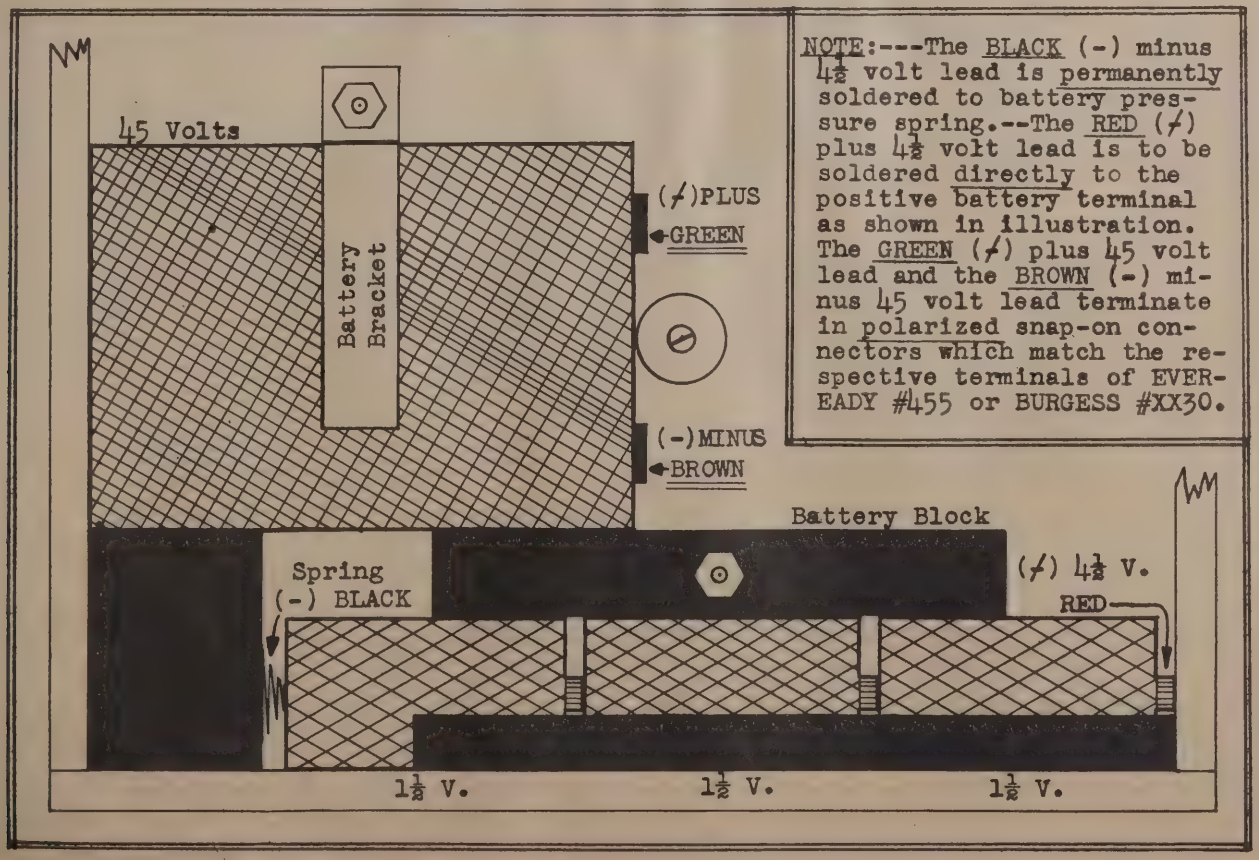
CAUTION: Always first disengage one end of resistance from the circuit before making resistance measurements, or else an indication of the true resistance value may not be obtained due to the possibility of the circuit therein involved effectively shunting the resistance to be measured, thus reducing the true reading by an amount proportionate to the resistance of the included shunt network.

BATTERY CONNECTIONS

The first three ohmmeter ranges are powered by (4½ volts) three medium size 1½ volt flashlight batteries: EVEREADY #935, BURGESS #1 Uni-Cell or equivalents.

The extra high (0-10 Megohm) range is powered by a 45 volt battery: EVEREADY #455 Minimax, BURGESS #XX30 or equivalent.

Batteries are installed in accordance with the illustration below and should be replaced whenever full scale meter deflection can no longer be obtained.



NOTE:---The BLACK (-) minus 4½ volt lead is permanently soldered to battery pressure spring.--The RED (+) plus 4½ volt lead is to be soldered directly to the positive battery terminal as shown in illustration. The GREEN (+) plus 45 volt lead and the BROWN (-) minus 45 volt lead terminate in polarized snap-on connectors which match the respective terminals of EVEREADY #455 or BURGESS #XX30.

OUTPUT METER INDICATIONS.

The A.C. voltage measurements at a high sensitivity of 1000 ohms per volt makes the instrument ideally suitable for use as an output meter.

There are two methods that can be used for obtaining output meter indications as listed below:

In the first method, make connections from the voice coil of speaker or secondary of output transformer to "TEST" tip jacks. In the event that easy access to the voice coil or secondary of transformer cannot be had, then refer to method outlined below.

In the second method, make connections from plate of output tube and ground or chassis of radio receiver to "TEST" tip jacks with a .25 mfd. condenser in series with one of the leads in order to block the D.C. component. The voltage rating of this condenser should be comparable to the D.C. voltage appearing at the points across which the output measurements are taken.

PROCEDURE:

With the use of either method noted above, set "AC-DC" switch to the A.C. position and rotate RANGE SELECTOR to highest voltage range. An output meter indication will be had when signal generator and radio receiver is put into operation. If the meter indication is slight, then use the next lower A.C. voltage range, etc.

Any gain or loss by reason of balancing or trimming will be accordingly noted by corresponding meter pointer deflection.

NOTE: The output meter can also be used to great advantage for obtaining comparisons in tube performance by noting the difference in meter indications when any or all of the tubes are substituted in the radio receiver under test.

DECIBEL METER.

The instrument incorporates a direct reading and calibrated decibel scale enabling readings from -12 to +64 DB in six ranges.

The initial scale reading -12 to +16 DB is based upon a zero level of 6 milliwatts or 1.73 volts across a 500 ohm load, 500 ohms being that most commonly employed in audio work. The most common use of a decibel meter is that of a power level indicator across known impedances. Because of calibration at one definite impedance, conversions must be made to the new impedance when used at other than 500 ohms. Such tables may be found in a multiplicity of text books and technical magazines.

NOTE: Refer to Decibel Conversion Table, last page of this booklet for interpretation of decibel readings in terms of power, power ratios, voltage and voltage ratios.

Caution must be observed in the use of the DB ranges that the circuit across which the meter is placed is isolated from all D.C., else the meter may be damaged or at least erroneous readings obtained, depending upon whether the D.C. voltage is greater or less than the voltage scale to which the decibel scale corresponds.

PROCEDURE:

Make connections across 500 ohm load to "TEST" tip jacks. Set "AC-DC" switch to the A.C. position for all DECIBEL READINGS. Select suitable DB range on RANGE SELECTOR and read as follows on DB scale:

0 DB range,	read directly	on	initial	DB	scale	(-12 to +16 DB)
+14 DB range,	"	"	"	"	"	and add +14 DB
+28 DB range,	"	"	"	"	"	and add +28 DB
+34 DB range,	"	"	"	"	"	and add +34 DB
+40 DB range,	"	"	"	"	"	and add +40 DB
+54 DB range,	"	"	"	"	"	and add +54 DB

(Use 1200V tip jacks for 40 DB range and 6000V tip jacks for +54 DB range, with RANGE SELECTOR at 600 volt position.)

CURRENT MEASUREMENTS OF LEAKAGE IN ELECTROLYTIC CONDENSERS.

The leakage in an electrolytic condenser is measured in terms of D.C. current (per microfarad) flowing through the condenser when rated D.C. voltage is applied.

All electrolytic condensers contain an inherent current leakage. However, if leakage above an allowable amount is present, it can then be termed as poor. An allowable current leakage is dependent upon such factors as age and manufacturers' specifications of a condenser, design of power unit, filter system and rectifier tube of the radio receiver in which the condenser is incorporated. In general, considering an 8 mfd. condenser that has been in use (rated at 450 volts, the maximum allowable leakage is approximately .5 MA per microfarad or 4 MA total.

The following will serve as a basis for computing approximate allowable leakages:

(a) For condensers rated at 300 volts or more, leakage of approximately .5 MA per microfarad is permissible.

(b) For condensers rated between 100 to 275 volts, permissible leakage is approximately .2 MA per microfarad.

(c) For condensers rated below 100 volts, permissible leakage is approximately .1 MA per microfarad.

CAUTION: WHEN OBTAINING ELECTROLYTIC LEAKAGE MEASUREMENTS, HIGH VOLTAGE IS EMPLOYED. IT IS THEREFORE EXTREMELY IMPORTANT THAT THE FOLLOWING INSTRUCTIONS BE ADHERED TO IMPLICITLY TO PREVENT DAMAGE TO METER.

PROCEDURE:

With condenser disconnected from radio receiver circuit, CHECK CONDENSER FOR SHORT with ohmmeter using the 0-100M OHMS RANGE. POLARITIES MUST BE OBSERVED. The negative "TEST" tip jack is connected to outside can or negative terminal of condenser and the positive "TEST" tip jack is connected to the anode (positive) terminal of condenser. A decided low resistance reading or constant full scale deflection of ohmmeter pointer indicates that the condenser is shorted and should be rejected WITHOUT FURTHER TESTING.

When an electrolytic incorporated in a radio receiver is to be tested, the necessary rated voltage is automatically applied and the following connections are made for "forming" and measuring the current leakage, after being (ohmmeter) tested for short.

1. Set "AC-DC" switch to the D.C. position and rotate master RANGE SELECTOR to the 300 MA position.

2. Remove lead from (positive) anode terminal of condenser and connect this lead to the positive "TEST" tip jack with a PROPER LIMITING RESISTOR in series. (Where voltage applied to condenser is above 100 volts, the limiting resistor should be approximately 2000 ohms. When the applied voltage is below 100 volts, the value of the limiting resistor should be approximately 500 ohms. This limiting resistor is very important and should not be omitted.)

3. Connect the negative "TEST" tip jack to the (positive) anode terminal of condenser. (From the above connections, it can be seen that the "TEST" tip jacks, limiting resistor, condenser terminals and voltage source are in series connection.)

4. After series connections are made, turn on switch of radio set. The meter pointer will now deflect to near full scale and then gradually recede to the zero mark or near zero, after the expiration of about three minutes. THIS PROCEDURE IS KNOWN AS "FORMING" THE CONDENSER.

NOTE: A steady meter pointer indication without receding to or near zero (after forming process) indicates a shorted or leaky electrolytic and should be rejected WITHOUT FURTHER TESTING.

5. After "forming, short out the limiting resistor and read current leakage of condenser under test directly on the 300 MA scale. If meter reading is under 60 MA, set RANGE SELECTOR to the 60 MA position for a better meter indication and read on 60 MA scale, etc. (For computation of permissible condenser leakages, refer to basis noted previously.)

CAUTION: After this test is completed, always first disconnect the negative test lead from circuit before turning off power supply to prevent slamming of meter pointer due to discharge of condenser under test.

To test electrolytic condensers not incorporated in a radio set, an external D.C. power supply is necessary, preferably one that employs various voltage taps suitable to application for the various D.C. voltage condenser ratings. In this case, adhere to the same testing procedure as noted above in paragraphs 1, 4 and 5, but making the following series connections:

(a) Select voltage tap of D.C. power supply approximating rated voltage of condenser to be tested.

(b) Connect positive potential of power supply to the positive "TEST" tip jack with a 2000 ohm limiting resistor in series if applied potential is above 100 volts. If potential is 100 volts or under, use a 500 ohm limiting resistor.

(c) Connect negative potential of power supply to outside can or negative terminal of condenser.

(d) Connect negative "TEST" tip jack to the (positive) anode terminal of condenser.

(e) Refer to paragraphs 1, 4 and 5, for obtaining current leakage measurements.

QUALITATIVE PAPER CONDENSER TESTS.

The insulation resistance or permissible leakages of paper and mica condensers is expressed in megohm microfarads. A good 1 mfd. condenser will have an insulation of approximately 450 megohms. Furthermore, insulation resistance of paper and mica condensers of similar voltage rating is inversely proportional to its capacity, so that a .1 mfd. condenser will have ten times the insulation resistance of a 1 mfd. condenser or 4500 megohms. It therefore can be readily seen that it would not be practical to use the ohmmeter method for measuring leakages in paper or mica condensers.

In the method described below, a high D.C. potential is applied to the condenser in series with the proper D.C. VOLTS range to determine whether or not it has low insulation resistance or abnormal leakage.

The necessary D.C. potential can be obtained from an external high voltage D.C. power supply or from the power output tube socket of a radio receiver. In the latter instance, the plate prong position of that socket will be the positive high voltage lead and the negative return or ground will be the negative lead. Voltage to be applied to the condenser should be greater than its rated voltage.

PROCEDURE:

1. Measure the D.C. voltage obtainable from D.C. power supply. Then select the proper meter range that would indicate the greatest deflection for the voltage there available.
2. With the power supply OFF, insert the condenser to be tested in series with one of the test leads.
3. Turn ON power supply. An instantaneous deflection due to the charge of the condenser will be indicated on the D.C. meter.

(a) In the case of a good condenser, the needle pointer will recede to the zero voltage mark.
(b) If the meter pointer remains above the zero mark, then this indicates that the condenser has abnormal leakage.
(c) If the meter pointer remains at the indicated value of the voltage measurement obtained primarily, then the condenser is "shorted".
(d) If no meter deflection is obtained, then this indicates that the condenser is "open" or that the capacity is too low in value to indicate an instantaneous noticeable meter deflection when charged.

NOTE: After this test is completed, always first disconnect the negative test lead from circuit before turning off power supply to prevent slamming of needle pointer due to discharge of condenser under test.

GENERAL INFORMATION

NOTE: A slight overload will damage or change characteristics of the meter rectifier incorporated. Rectifiers are checked before instruments leave the factory. It is important to note this fact inasmuch as rectifiers are not guaranteed when overloaded.

Instructions and guarantee card are enclosed with this instrument. Mail the guarantee card at once for future information to be mailed from this record. Always give Pattern No. and Serial No. when writing for information relative to this instrument.

SERIES 844 ACCESSORIES:

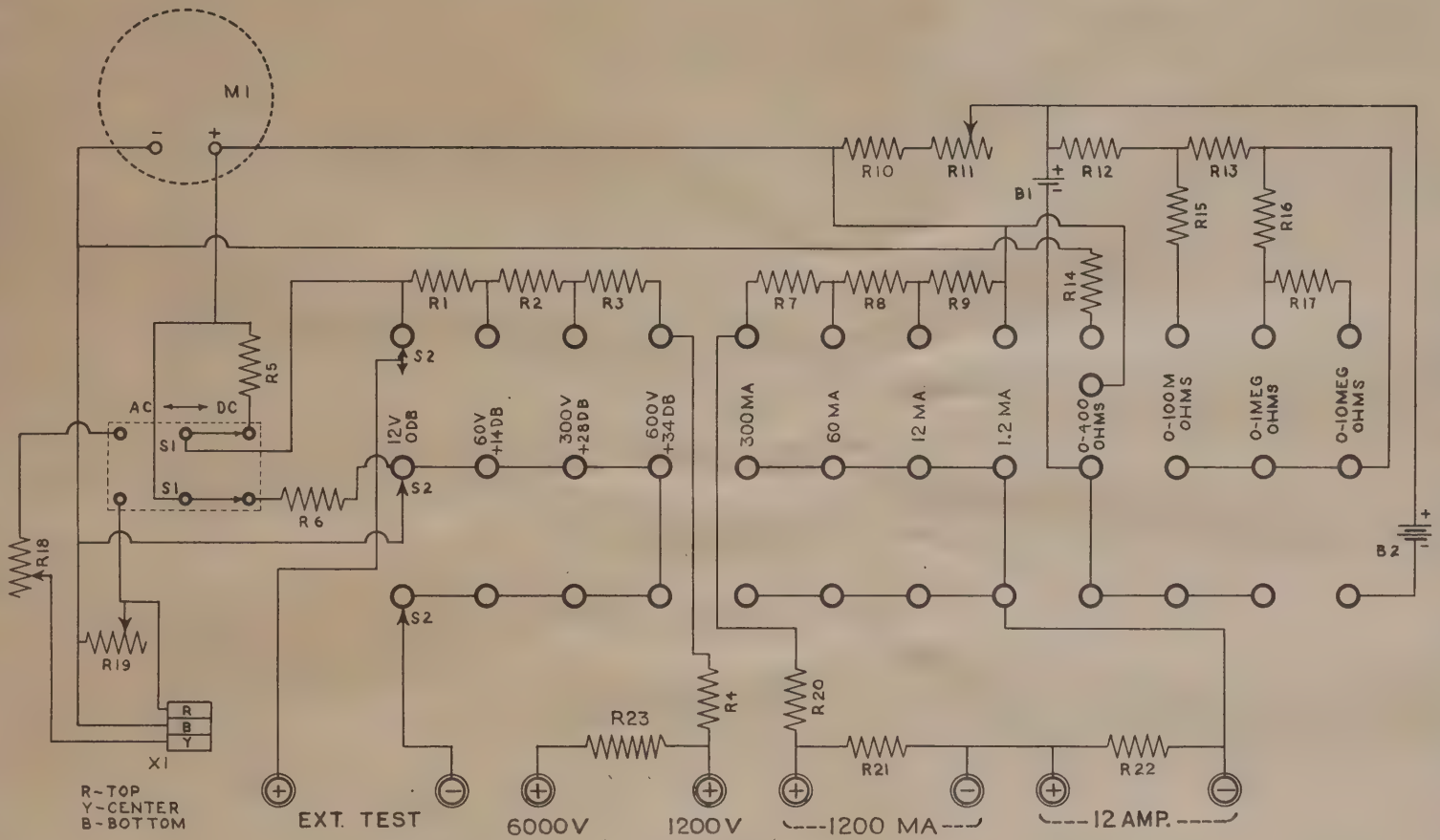
The following items are not included as original equipment unless ordered at time of purchase at prices noted below.

1	#~~955~~ 45 volt Eveready Battery	$1.65
3	#935 4½ volt Eveready Batteries	.30
1	Set extra high voltage Super-Flex test leads. Necessary for full safety of operation up to 6000 volts D.C. and 60 cycle A.C. (Part #228). .	1.65

* * * * * *

PRECISION APPARATUS COMPANY
92-27 Horace Harding Blvd.
Elmhurst, L.I., N.Y.

DW. NO. 1013-A



ITEM	PART NO.	SPECIFICATION
29	B2	45 VOLT BATTERY
28	B1	4.5 " "
27	R23	4.8 MEG Ω
26	R22	.02 Ω
25	R21	.2 Ω
24	R20	.598 Ω
23	R19	12M Ω SEALED (ADJ.)
22	R18	12M Ω " "
21	R17	72013 Ω
20	R16	7202 Ω
19	R15	531 Ω
18	R14	21 Ω CALIBRATED
17	R13	2592 Ω
16	R12	288 Ω
15	R11	550 Ω ADJUST OHMS
14	R10	500 Ω
13	R9	180 Ω
12	R8	16 Ω
11	R7	3.2 Ω
10	R6	266 Ω CALIBRATED
9	R5	11840 Ω
8	R4	600M Ω
7	R3	300M Ω
6	R2	240M Ω
5	R1	48M Ω
4	M1	400 MICROAMP-160MV.
3	X1	RECTIFIER
2	S2	3-DECK RANGE SELECTOR
1	S1	D.P.D.T. AC-DC SELECTOR

SERIES 842A SAME SPEC'S AS SERIES 844 EXCEPT 3000V. RANGE INSTEAD OF 6000V. R23 IS 1.8 MEG. Ω

PRECISION APPARATUS CO.
BROOKLYN, N.Y.

TITLE- SERIES 844 862 SCHEMATIC

DRAWN BY J.H.O. DATE 1/30/40

CHECKED BY [illegible] DATE 1/30/40

DECIBEL CONVERSION CHART

Power Level DB	Power Ratio to 0 DB	Power .006 Watt at 0 DB Watts	Voltage Ratio to 0 DB	Volts—Based on .006 Watt at 0 DB in	
				500 ohms	600 ohms
− 10	0.1000	0.0006000	0.31623	0.5477	.6000
− 9	0.1259	0.0007553	0.35481	0.6145	.6732
− 8	0.1585	0.0009509	0.39811	0.6895	.7554
− 7	0.1995	0.0011972	0.44668	0.7737	.8475
− 6	0.2512	0.0015071	0.50119	0.8681	.9509
− 5	0.3162	0.0018975	0.56234	0.9740	1.0670
− 4	0.3981	0.0023886	0.63096	1.0928	1.1972
− 3	0.5012	0.0030071	0.70795	1.2262	1.3433
− 2	0.6310	0.0037857	0.79433	1.3758	1.5071
− 1	0.7943	0.0047660	0.89125	1.5437	1.6910
0	1.0000	0.0060000	1.00000	1.7321	1.8974
+ 1	1.2589	0.0075535	1.1220	1.9434	2.1289
+ 2	1.5849	0.0095093	1.2589	2.1805	2.3886
+ 3	1.9953	0.0119716	1.4125	2.4466	2.6801
+ 4	2.5119	0.0150713	1.5849	2.7451	3.0071
+ 5	3.1623	0.0189747	1.7783	3.0801	3.3741
+ 6	3.9811	0.0238865	1.9953	3.4559	3.7867
+ 7	5.0119	0.030071	2.2387	3.8776	4.2477
+ 8	6.3096	0.037857	2.5119	4.3507	4.7660
+ 9	7.9433	0.047660	2.8184	4.8816	5.3475
10	10.0000	0.060000	3.1623	5.4772	6.0000
11	12.589	0.075535	3.5481	6.1455	6.7321
12	15.849	0.095093	3.9811	6.8954	7.5536
13	19.953	0.119716	4.4668	7.7368	8.4752
14	25.119	0.150713	5.0119	8.6808	9.5094
15	31.623	0.189747	5.6234	9.7400	10.670
16	39.811	0.238865	6.3096	10.9285	11.972
17	50.119	0.30071	7.0795	12.2620	13.433
18	63.096	0.37857	7.9433	13.7582	15.071
19	79.433	0.47660	8.9125	15.4369	16.910
20	100.000	0.60000	10.0000	17.3205	18.974
21	125.89	0.75535	11.220	19.434	21.289
22	158.49	0.95093	12.589	21.805	23.886
23	199.53	1.19716	14.125	24.466	26.801
24	251.19	1.50713	15.849	27.451	30.071
25	316.23	1.89747	17.783	30.801	33.741
26	398.11	2.38865	19.953	34.559	37.867
27	501.19	3.0071	22.387	38.776	42.477
28	630.96	3.7857	25.119	43.507	47.660
29	794.33	4.7660	28.184	48.816	53.475
30	1000.00	6.0000	31.623	54.772	60.000
31	1258.9	7.5535	35.481	61.455	67.321
32	1584.9	9.5093	39.811	68.954	75.536
33	1995.3	11.9716	44.668	77.368	84.752
34	2511.9	15.0713	50.119	86.808	95.094
35	3162.3	18.9747	56.234	97.400	106.70
36	3981.1	23.8865	63.096	109.285	119.72
37	5011.9	30.071	70.795	122.620	134.33
38	6309.6	37.857	79.433	137.582	150.71
39	7943.3	47.660	89.125	154.369	169.10
40	10000.0	60.000	100.000	173.205	189.74
41	12589.2	75.535	112.20	194.34	212.89
42	15848.9	95.093	125.89	218.05	238.86
43	19952.6	119.716	141.25	244.66	268.01
44	25118.9	150.713	158.49	274.51	300.71
45	31622.8	189.747	177.83	308.01	337.41
46	39810.7	238.865	199.53	345.59	378.67
47	50118.7	300.71	223.87	387.76	424.77
48	63095.7	378.57	251.19	435.07	476.60
49	79432.7	476.60	281.84	488.16	534.75
50	100000.0	600.00	316.25	547.72	600.00

PRECISION APPARATUS COMPANY

Manufacturers of Fine Electrical Test Equipment

PRECISION SERIES 844 Multi-range Tester